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TRANSACTIONS

OF

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND

WITH

AN ABSTRACT OF THE PROCEEDINGS AT BOARD AND GENERAL MEETINGS, AND THE PREMIUMS OFFERED BY THE SOCIETY IN 1900

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TRANSACTIONS

OF

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND

WOOL-GROWING AND WOOL-SHOWING.

By Professor JOHN SCOTT, Edinburgh.

IT is to be feared that since the great fall in the price of wool many farmers have become rather indifferent about this farm product, and only continue to grow it because they are obliged to handle it in connection with the sheep. The relative importance of wool, as a source of farm revenue, is certainly not what it was thirty years ago. At that period the fleece represented 25 to 35 per cent of the returns from sheep; in the present year it only furnishes about 12⅓ per cent of the income from a hill farm, and not more than 10 per cent of the returns from sheep on cultivated land.

The fall in the price of wool, great though it is, does not fully explain the decline in its relative importance. But the additional reasons why the value of the national clip has fallen relatively more than the fall in the price of wool, are not far to seek. The country has fewer sheep than it had thirty years ago: by crossing with improved varieties of mutton-sheep, however, and by improved feeding, the sheep now clip more wool per fleece; so that the total clip has not suffered much decrease in weight on account of there being fewer sheep. On the other hand, great progress has been made in mutton-raising, and the sheep of to-day is a very different animal, both in weight and earlier

maturity, from the sheep of the preceding generation. As the mutton product has increased enormously in quantity, while there has been no increase at all in the wool product, and at the same time the fall in the price of mutton has been very little compared with that in wool, it is not surprising to find that the latter article has declined far more than the proportionate fall in prices.

Mutton v. *Wool.*—The enormous annual increase in the quantity of wool imported, together with the falling price of that article, made our farmers, some twenty years ago, turn their attention to producing the greatest possible weight of mutton. In pursuit of that end they have since continued to breed larger and opener-woolled sheep, without much regard to the effect of such breeding on the wool of their flocks. They may have been right for a time. But the conditions are now changed. Imports of mutton have latterly increased as fast as did the imports of wool twenty years ago, and our farmers are face to face with a crisis in the production of mutton more acute than any they have had to meet in regard to wool.

The fact that colonial-imported and home-grown wool last year averaged as nearly as possible the same price, seems to favour the belief that we have touched bottom prices for wool. During the last few years the imports of wool have shown but a slight increase, which is also evidence that prices are nearly level, and that colonial farmers cannot hope for any rise in the price of wool now shipped to us, unless the rise is general.

With mutton it is altogether different. The average retail price of home-raised mutton is now 6d. per pound, and the wholesale price of imported mutton at Liverpool or Glasgow is 2½d. per pound.

For some years to come, then, the energies of colonial sheep-breeders are likely to be more attracted by the margin for profit in their mutton produce than in sending us larger supplies of wool. A rise of 1d. per pound in the price of imported mutton, which may well take place without a rise in the British article, would suffice to send us twice, or if need be four times, the quantity of colonial mutton that we are now getting. Assuredly no rise in the price of home mutton need be looked for until the home and colonial articles have found a price level, and that will mean a further fall of perhaps 2d. per pound in the price of home mutton.

Wool and Mutton.—The farmer's aim should be to breed sheep for all they are worth. The ideal sheep for profit is the one that combines wool and mutton, both of the finest quality and the greatest quantity. All our improved breeds

of sheep are well adapted for this, according to their kind; and with one or two exceptions they will thrive on almost any variety of soil within the British Islands, if the keep is nutritious.

Possibilities of Wool-growing.—Perfection has not yet been reached in this branch of farming. There is room, and to spare, for improvement. Wool-manufacturers, if not wool-growers, will agree that the difference in value between two clips, one fine wool and the other coarse wool, but both from the same breed of sheep, and grown in the same district, may be as much

2

(Half natural size.)

Fig. 1. *A lock of Cheviot wool.*
Fig. 2. *A lock of Cheviot ewe wool showing break in growth and an uneven staple.*
Fig. 3. *A lock of Half-bred wool.*
Fig. 1. *A lock of Border Leicester wool.*
Fig. 5. *A lock of Scotch Blackfaced wool.*

as 5s. per stone, or 2½d. per pound. That is for quality alone. There may be about as much difference in value, caused by the "condition" and get-up of the shorn wool. And if the weight of the clip be increased at the same time, as it easily can be, 5 to 10 per cent, or more, by better feeding, better shelter, and the like, the increase in quantity, and the improved quality, condition, and get-up of the wool, all taken together, may very well be as good to the farmer as a rise of 50 per cent in the price.

These are great and cogent reasons why British farmers should give more attention to the production of wool. Before we proceed to consider how this is to be done, however, let us have

a clear understanding of the nature of wool, its conditions of growth, and the special qualities which make it valuable for manufacturing purposes.

The Nature of Wool.

In a single sentence the late Professor Owen has given a definition of wool which may serve for all time. "Wool," he says, "is a peculiar modification of hair, characterised by fine transverse and oblique lines, from 2000 to 4000 in the extent of an inch, indicative of a minutely imbricated scaly surface when viewed under the microscope, on which, and on its curved or twisted form, depends its remarkable felting property, and its consequent value in manufactures."

The Difference between Wool and Hair.—This depends upon such slight modifications that it is very difficult to determine where the characteristics of true hair cease and those of wool begin. There is nothing peculiar in the longitudinally waved or curled structure of the wool; for true hair is often curly

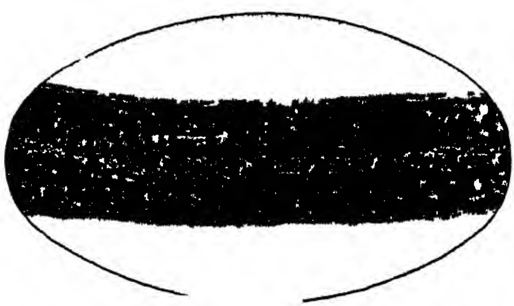


Fig. 6 (magnified 300 times).—*A fibre of Cheviot wool.*

and true wool is sometimes straight. The true difference consists in the scaly exterior of the wool surface: it is in this scaly exterior, and in this alone, that wool differs from all other fibres or hairs.

Structure and Formation of Wool.—Wool is not a solid structure, but is composed of a softer medullary portion or pith, and a harder cortical layer. It is an epidermal growth, contained in little pits or depressions, called follicles. The root of the follicle is enlarged at its extremity into a knob, into which projects a vascular papilla from the dermis or underlying skin, the surface of which is covered with minute papillæ; and it is these which, viewed through the cuticle, give the perforated appearance to the skin. The medulla or pith can be traced from near the point of the fibre to the deepest part of the

follicle, where masses of spherical cells are seen to envelop a papilla or vascular projection. It is from this papilla that the wool fibre is formed, by a multiplication of the cells in the deepest layer of the skin. The newly-formed cells push out those previously formed, which become more and more scaly as they approach the surface. The cells are grouped together as they push their way through the cuticle, and, as their fluid evaporates, the cell-walls shrink in and form a small hollow stalk or fibre. The shrunken cells are superimposed like the leaves of a fir-cone, and, wool being of a gelatinous nature, as each soft cell comes out, it forms both a partial covering and bed for its predecessor, and so makes one compact and continuous fibre. The margin of the shrunken cells is imbricated or serrated, and it is from these serratures and scaly exterior on the fibre that wool derives its felting property.

The felting power of wool increases or diminishes in proportion to the number of serrations or scales on the surface of

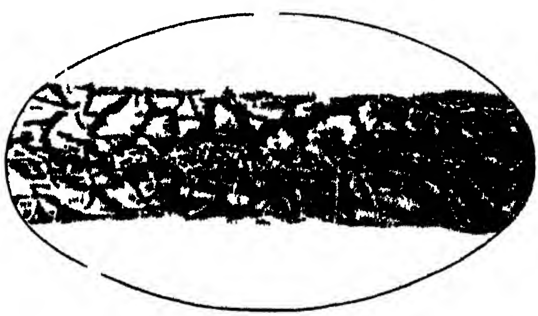


Fig. 7 (magnified 300 times).—*A fibre of Half-bred wool.* Dia. $\frac{1}{500}$

the fibre; while the number of serrations increase or diminish with the fineness or coarseness of the wool. It follows, then, that wool with the finest fibre has the greatest number of serrations; that the greater the number of serrations the greater the felting power of the wool; and that as the wool grows finer it increases in intrinsic value. "That theory," Mr R. G. Laidlaw, a Hawick manufacturer, assures us, "will hold good under whatever test you please to place it, whether the wools be required for carding or combing."

How Wool Grows and Feeds.—We have seen that wool grows from papillæ within follicles, and that the wool fibre finds its starting-point in the deeper layer of skin. The papilla is composed of a great number of cells containing fluid which is obtained from the blood when that is in a proper condition for supplying it. The follicles are filled naturally with an oily matter; but when the fibre is formed the little blood-vessels

from the papilla supply the lower part of the follicle, and the supply of the cells depending upon the quantity of blood or materials for nourishment at the bottom, the cells grow faster there, and the fibre is, as it were, pushed out. Wool is thus fed directly from the blood when that is in a proper state; and it does not appear that it can be directly fed otherwise, although Youatt, while he admits that it grows principally by additions from the root, says that it is capable of deriving nourishment from vessels belonging to its pith.

The Importance of Yolk in Wool.—The sebaceous secretion, a compound of oil and potash, which we find so abundant in the skin of the sheep, plays a very important part in producing a good staple of wool. This is secreted in the deeper layers of the skin, and passes up by the sebaceous glands to lubricate the surface of the skin and fleece, and to protect them from excessive moisture. It also protects the fleece from dead ends; it much increases the strength, softness, and elasticity of the wool fibre; and both directly and indirectly it promotes a healthy growth of wool. There is never good wool when the yolk is deficient; and that is sure to occur if the sheep are either in low condition or in ill health, or are exposed to long-continued drenching rains in cold weather.

Matted Fleeces.—Notwithstanding that the property of felting or matting enables a number of fibres, whether woven or merely compressed, to interlock and join together so that they form one compact whole, if the animal conditions are healthy the wool does not felt on the sheep's back. Nature has made two provisions against it doing so. One is, that on the fleece all the scales are lying one way, with their ends towards the point of the fibre. The other hindrance to felting on the sheep's back is found in the greasy yolk from the skin which repels the action of water and keeps the wool free. It is only when this natural protection of a healthy fleece fails, through insufficient nourishment or neglect of the animal, or where injurious chemicals used in sheep-dip remain in the wool and destroy or remove the yolk as fast as it is formed,—it is only in such cases that the wool mats or felts on the sheep's back.

Effect of Wool-growing on Soils.—A chemical analysis of wool shows that it contains large quantities of nitrogen, potash, and sulphur, amongst other constituents,—approximately about 5 cwt. of nitrates, 2 cwt. of potash, and 1 cwt. of sulphur for every 1000 sheep that are clipped. At first sight it may appear that this annual drain of these most valuable elements of soil fertility from a pasture which gets no manure save the droppings of the sheep grazed on it, must result in a yearly diminishing crop of wool. This, however, is entirely to misapprehend the sources of soil fertility. The mineral constituents of the wool are of course

derived from the grass consumed by the sheep, and the grass obtains these chiefly, if not wholly, from the soil; but a soil does not become impoverished by giving off its annual crop under the natural conditions of pastoral farming. All it so yields is the natural annual increment or produce of the soil. If it were

Fig. 8 (magnified 300 times). *A fibre of Border Leicester wool.* Dia. $\frac{1}{400}$.

otherwise there would be no need to talk about rents and land values; for all living things would have perished off the face of the earth ages ago, from the annually diminishing power of the soil to feed them.

QUALITIES AND USES OF WOOL.

Much difference of opinion exists as to what should be and what should not be considered wool of first-class quality. This is no wonder, since the qualities of fibre which go to make up a first-class wool vary not a little with the breed or class of sheep which produces it; and since variations, in the same class of wool even, are as numerous as the different conditions under which the wool is grown in different localities, and even on different farms in the same locality. There are, however, certain qualities in wool which are common to all varieties, and the possession of which, in a greater or lesser degree, determines its uses for manufacturing purposes, and consequently its market value. These desirable qualities are fineness, soundness, length, felting property, fulness, freeness, softness, colour, and trueness of breeding.

1. *Fineness.*—This is a relative term when applied to wool. Cheviot wool, for example, has sometimes a diameter of $\frac{1}{450}$ths of an inch, while the finest Saxony merino wool has a diameter of not more than $\frac{1}{1800}$ths of an inch. In the same breed, however, the finest wool is always the best; it makes a much better thread than coarse wool, and spins to a far finer size.

The conditions which modify the fineness of the fibre should therefore be studied with great care.

If there is no deficiency in this quality, the difference between the shoulder wool, which is the finest, and the neck wool, which is the coarsest, will be so gradual as to be almost imperceptible. This can be easily judged of by the naked eye, when a fibre of wool from each of the parts is laid upon a black coat-sleeve. The uniform fineness of each fibre throughout its length shows that the sheep which grew it has been in uniform good health and condition; while variations in the diameter of the same fibre indicate irregularity in the health, nutrition, or management of the animal,—any shortcomings in any one of these respects being shown by a diminished diameter of the fibre at the period of growth when the interruption occurred.

2. *Soundness.*—The term as used here means also strength and elasticity. Any tenderness or weakness in the fibre, such as is

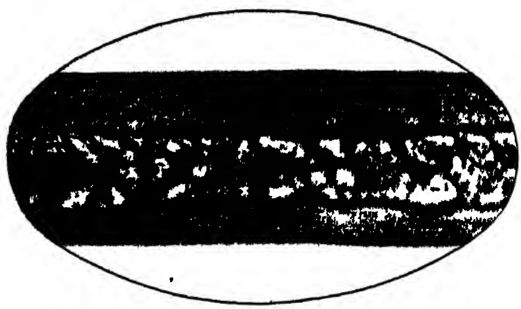


Fig. 9 (magnified 300 times).—*A fibre of Scotch Blackfaced wool.* Dia. $\frac{1}{170}$ in.

sure to occur if there has been irregularity in the health or nourishment of the animal, greatly depreciates its value, as a weak-stapled wool will not stand combing, and if the wool has lost its elasticity it does not spin well. When there is any tenderness, it will show itself along the ridge of the back; so that if a small staple from that part proves sound, and does not give way when pulled lightly from end to end, it is safe to conclude that the whole of the fleece is sound in that respect.

3. *Length.*—The length of wool has to be carefully regulated to suit the soil and climate where it is grown. Excess of length is shown when the wool twists into hard bands, like pieces of twine; and there is a proportionate deficiency in soundness. Fine wool is never of great length; but whether it is more valuable than that which is stronger and long, depends on the use to which they are to be put.

4. *Felting Property.*—This is known by the degrees of imbrication of the scaled surface, as shown by the microscope. The

imbrications vary from 1280 to 4000 to an inch. It is the number or proportion of these imbrications or serratures that determines whether the wool is used for carding or combing. In long wool they are fewer than in short wool. Short wools are therefore preferred for carding purposes or cloth manufacture, not only because they are usually finer and softer, but also because of their superior felting property; and long wools, which do not felt so well, are used for combing purposes or worsted manufacture.

5. *Fulness.*—The closeness of the wool fibres on the skin, or the number grown on a square inch, should be carefully examined, as the density of the fibres, even more than the length of them, determines the weight of the fleece. When a sheep possesses this quality in perfection, only a thin line of skin will be visible when the wool is shed, or divided, on any part of the body. Many of the Leicesters and Blackfaces, also some of the Cheviots, would be much more valuable as wool-producers if they were not so open fleeced.

6. *Freeness.*—In a well-bred sheep the separate staples or locks of wool, and also the separate fibres of each staple, are quite free and distinct, and when the wool is opened by the hand the locks fall apart without the least entanglement. If the wool is deficient in this quality, it will either be "smushy" or "ropy," both of them bad characters.

7. *Softness.*—This desirable quality depends on fineness of fibre and a plentiful secretion of yolk by the skin. The best grown wools are always the softest; while weak-stapled wools are the harshest, most brittle, and least elastic. If there is any want of softness it will be most noticeable on the crop and neck.

8. *Colour.*—Pure whiteness of wool all over the fleece is valued for its own sake, and also for the evidence it affords of true breeding. Lustre is not colour but some inherent brightness, which cannot be cultivated beyond the narrow limits within which lustre wool is naturally grown.

9. *Trueness of Breeding.*—This comprehends all the qualities. Want of even strain in one or all of them is a serious fault in many wools, and is either the result of careless breeding or of the changeableness of breeders in the class of sheep they breed from. It is necessary to study fixity of type in wool as well as in the form of the animal.

Fine v. *Coarse Fleeces.*

It is sometimes alleged that sheep with fine fleeces are softer and not so hardy as sheep with strong fleeces; also that the latter kind of fleece is the best protection for sheep which have to be wintered in high and exposed situations.

It is quite true that there are soft sheep of the fine-woolled class, and that fineness of wool has in many cases been acquired at the expense of the hardiness of the sheep. But loss of hardiness arises from a very different cause than the fineness of the fleece. It is occasioned by breeding the sheep too big for the land, the result, in most cases, of injudicious crossing with heavier mutton-sheep. Every farmer and every shepherd knows that the best fattening animals in the flock are always the finest-woolled ones; also that the finest-coated ewes are the best nurses and rear the best lambs.

Again, although much has been said to the contrary, a sheep with a thick fleece of fine wool can and does stand the storm better than a sheep with a coarser and opener-woolled fleece. The above-mentioned characteristics of fine-woolled sheep support this view, and I believe that it holds good in every case

(Half natural size.)

Fig. 10.—*A lock of Shetland wool.*
Fig. 11.—*A lock of Shropshire wool.*
Fig. 12.—*A lock of Southdown wool.*
Fig. 13.—*A lock of Merino wool.*

where the breeder has not fallen into the error of breeding his sheep too big and soft for the land. Mr Alexander Willison, who is both a sheep-farmer and a wool-manufacturer, and who speaks with the fullest knowledge of this subject, says that "many farmers who farm high, stormy, and wet land are finding out, through experience, that the rough strong fleece is not the most suitable for such land." Sir John Sinclair, at the beginning of the century, was very emphatic on this point. Writing on the wool of mountain sheep at that period, he said: "In general, in the mountainous districts, both of England and Scotland, they have got into a species of sheep with coarse, thin, loose, open fleeces; so that the least breeze exposes the skin to the blast, and the slightest shower of rain penetrates it. No species of sheep can be more incompatible with a high situation; for a true mountain sheep ought to have a short fleece, that it may be

more portable, a thick fleece to prevent either snow or rain penetrating it, and a fine-woolled fleece to keep the animal warm,—fine wool being infinitely warmer than coarse."

Fineness of wool does not necessarily mean a smaller fleece. A sheep with a fine close fleece may grow as much wool as a sheep with a long open one, and it will certainly be better protected from the weather. There is also the further consideration that the fine fleece is worth several shillings per stone more money than the coarse fleece.

Natural Influences in Wool-growing.

Climate, soil, and pasture all exert a very marked influence on the growth and character of the wool. The influences named have given to each breed of sheep any special characteristics it possesses in regard to wool, and the perpetuation of these characteristics depends much upon whether they were acquired under environments similar to those under which the sheep are now placed. If they were acquired on a different soil, or in a different climate, there will be a change, for the worse if not for the better.

It matters comparatively little what breed is cultivated, so long as the sheep are hardy and adapted to the grazing. Adaptability to surroundings is, indeed, the very first consideration in the choice of sheep for wool production. And, whatever the breed, it is of the utmost importance that the flock should combine the very best blood of its kind, and be all of one strain of wool; also that the sheep be kept in vigorous health and condition, and be not too aged for growing the best wool.

If the sheep are well adapted to the soil and pasture, and the climate is favourable, we have all the conditions for growing good wool of the class most suitable to the locality. But although every one of the influences mentioned operates wherever wool is grown, one and all of them vary in effect in different districts, and even on different farms in the same district. This gives rise to an immense number of modifications in the character of wool, even with sheep of the same breed.

In well-tended flocks, however, these variations are reduced to a minimum by suitable shelter, by improved pasture or artificial food, and by general care and good management.

Means of Improvement.

Whatever will improve the sheep will improve the wool, either in quantity or quality, if not in both. The important thing to bear in mind is, that the improvement of the wool is as com-

pletely under the control of the flock-master as the improvement of the sheep itself.

The means that can be employed with this object are, however, limited to Breeding by Selection, Feeding for Wool, and Sheltering the Flock in Winter.

1. *Breeding by Selection.*—This is the only line of improvement open for the production of new breeds or varieties of wool. It is also the only way to organically improve the wool of an established breed. There is no flock so perfect in fleece that it cannot be improved by selection, from within or without. The latter may be occasionally practised when there is any special object to be attained by the introduction of new blood; but when once a farmer has brought his sheep up to a certain state of perfection both in wool and mutton, he will do better, as a rule, to continue to breed by selection from within his own flock. This is more essential for fine wool than for mutton, as a very slight mixture

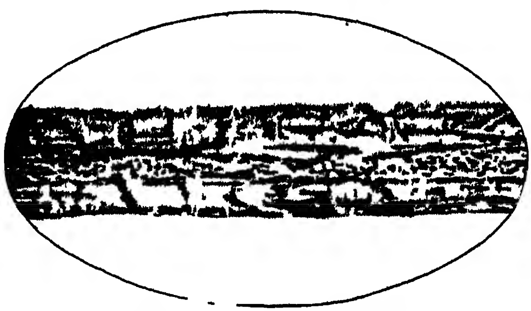


Fig. 14 (magnified 300 times).—*A fibre of Shetland wool.* Dia. [illegible]

of breeds will often entirely destroy the special qualities which made the wool valuable.

As the ram is found to possess far more power in modifying the fleece of the offspring than the ewe, it is of the first importance to exclude from the flock all coarse-fleeced rams. For the same reason, when rams have to be bought they should be the very best of the breed obtainable, to suit the ewes with which they are to be mated. But while the influence of the rams is predominant, the proper selection of ewes must also be studied, in order more easily, if necessary, to correct defects, and to preserve, or if possible to improve, the best qualities of the fleeces of both parents in the offspring.

In carefully mated flocks the wool is both heavier and finer, and of course fetches a higher price per pound. The difference of a shilling or two in the produce of each sheep, in a flock of some thousands, means a good deal, and well repays the extra care and expense of obtaining it.

2. *Feeding for Wool.*—The food required for promoting growth and quality of wool differs but little from the ordinary rations for sheep.

The special requirement for wool is a little sulphur, which is abundantly supplied in such green crops as clover and vetches. The influence which these foods have on wool has been frequently observed, and we have in this fact an explanation of much of the softness of texture thereby produced. The other materials required for wool growth are equally needed for the other parts of the body.

Wool fibre is largely made up of flesh-forming elements; therefore in the production of wool foods rich in albuminoids are the best. The summer grass or pasture yields these elements in abundance for the purpose, but wool cannot be grown from winter pasturage alone. And although sheep can be kept fat all winter on turnips only, it is done at the expense of the wool fibre. Too much fattening food increases the length as well as the coarseness of the wool, which also loses its elasticity. We must feed the right food if the sheep are to clip a heavy fleece; and in winter they require, besides grass and turnips, an allowance of good hay, cake, or corn. If to the ordinary supply of food the sheep are given some variety of legume, or are fed more directly a quantity of sulphur, the growth and quality of the wool will be thereby greatly promoted.

3. *Winter Shelter.*—Summer rains do not injure sheep, and they are animals that do not require close housing at any time; but during winter and early spring occasional shelter is half meat to the flock. A dry lair and a dry fleece are both essential at these seasons. Prolonged winter rainfall is worse than a snowstorm on a flock, as the rain soaks through the wool and runs off the sheep, carrying the heat from the body with it. If the animal survives the hardships of this winter exposure, it comes through it in a greatly reduced condition, and the wool suffers in proportion. Fleeces grown under such unfavourable conditions are not half so heavy as those from sheep which have been winter-sheltered. The difference in quality is also remarkable, and speaks strongly in favour of temporary shelter for the fleece.

The Cost of Growing Wool.

It is not easy to determine what proportion of the cost of sheep-keep should be charged to the wool and to the mutton respectively. If any one can show the average cost of 1 lb. of wool as produced in our different breeds of sheep, and also the cost of mutton on the same classes, it would show the best class of sheep to keep for profit in any given locality. The profits of wool-growing, however, can only be increased by reducing the

cost, and the only way to do that is to grow more wool of a better quality. This can be partly accomplished in the ordinary way by growing heavier fleeces of improved quality; but something more is needed if wool is to be grown for all that it is worth, and this, I feel sure, will only be accomplished by breeding for earlier maturity in wool, and by clipping the lambs once, and the older sheep twice a-year, in conjunction with winter shelter.

Early Maturity in Wool.—Early maturity is as desirable in wool as in mutton. In point of quality, lambs' wool is the best, and fetches the highest price per pound; but taking quality and weight together, the hogget fleece and the second year's clip are the most valuable ones. After sheep are three or four years of age the wool gradually becomes coarser, and otherwise deteriorates in quality, while it does not weigh so well. Not only, then, do young sheep clip more wool, and wool of better

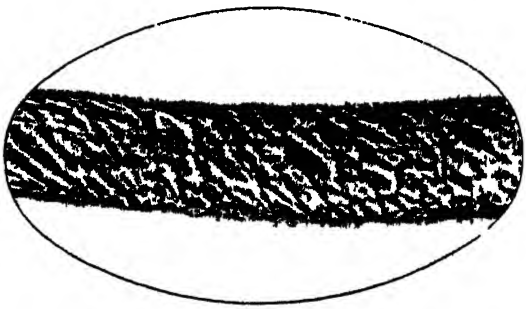


Fig. 15 (magnified 300 times).—*A fibre of Australian Merino wool.* Dia. [illegible].

quality, which is worth a higher price than the wool of old sheep, but six young sheep can be kept in place of five old ones. It costs, therefore, nearly as much to grow £1 worth of wool with old sheep as it does to grow £2 worth with young sheep. This fact is destined to have a far-reaching influence in the future production of wool in this country, under the prevailing low prices.

Clipping Lambs.—This is occasionally practised, and will have to become the general rule, if early maturity in wool is to be turned to profitable account. The economy of allowing an early lamb to carry its fleece sixteen or eighteen months is too questionable.

There is no cruelty to animals in shearing lambs in summer. All early lambs, at any rate, might be shorn in August, with great advantage both to the lambs and their owners. The lambs are more comfortable, grow better, and go into winter in better condition; while they shear almost as much wool

the following summer as if the lamb fleece had not been taken.

A correspondent of the 'Farmers' Gazette,'[1] who clips some of his lambs every year and winters them on grass, says he has invariably found the clipped lambs in fair condition when the unclipped ones were very thin; and his experience is that, on any kind of feeding, the clipped lambs come out fat six weeks earlier than the unclipped ones.

This is an experiment which any farmer can try for himself. If the lambs are shorn in August, the wool will be sufficiently grown before winter; still, if they are at all thin-skinned or open-woolled, it is safer to give the clipped lambs winter shelter.

The correspondent above quoted says his lamb fleeces last year made an average price of 4s. This is a return which the sheep-farmer cannot afford to dispense with in these days of small returns from other sources.

Clipping twice a-year.—This is another practice which demands a fair trial at the hands of flock-masters. It is recommended in connection with the house-wintering of sheep, not otherwise.

Its advantages are: the sheep are more healthy, and thrive better; they are more free from vermin, and the wool is consequently cleaner; there is no expense for dipping; the sheep clip more wool; and the wool being of better quality is worth more money per pound. Briefly put, this practice, if combined with the others mentioned, will double the wool production, and reduce the cost of wool-growing one-half.

House-wintered sheep may be clipped at the end of May, after they have been some weeks on the grass, and again in November, when they are taken into shelter for the winter. The winter fleece will be found extra heavy when grown under shelter, and the November clip will be about the same weight as the ordinary fleece at present with one clipping; for at present one-half or more of all the sheep in this country are lighter both in wool and mutton when the grass comes in spring than they were at the beginning of winter. This is a fact for sheep-farmers to ponder on, when they see their bedraggled flocks visibly losing condition in severe winter and spring weather out of doors.

"Condition" and "Get-up" of Wool.

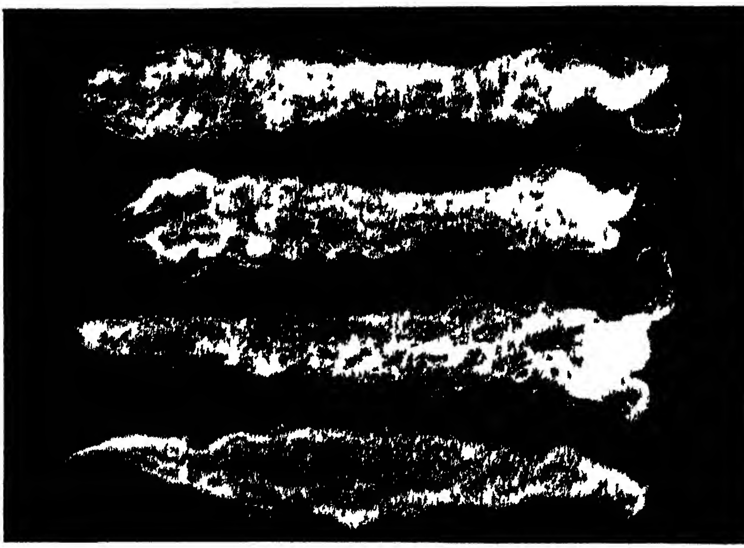
Condition almost as much as quality determines the price of wool, because without condition quality loses much of its value. Quality, however, is a property inherent in the wool; whereas condition is something changeable, and merely denotes the state

[1] Farmers' Gazette, April 8, 1898.

in which we find the wool for the time being, irrespective of its quality.

The quality of the wool, as we have seen, can be much improved by proper care in the breeding, feeding, and management of the sheep which produces it; but when the wool is off the sheep nothing can further improve its quality.

Condition, on the other hand, depends largely on the mode of handling the wool after it is off the sheep,—on dry and clean shearing; on the proper skirting of the fleeces, on clean rolling; on careful handling and packing, and on dry storage



(Half natural size.)

Fig. 16.—A lock of Lincoln hogg wool.
Fig. 17.—A lock of Lincoln wether wool.
Fig. 18.—A lock of Cotswold hogg wool.
Fig. 19.—A lock of Cotswold wether wool.

But "condition" is not altogether an after-effect, and depends also not a little on the wool being properly grown and cared for while it is on the sheep's back,—on an even and healthy growth of the fleece; on the sheep being kept clean and free from vermin; on the non-use of dips which destroy the yolk, equally with those which stain the wool; on the avoidance of injury to the wool by tar-branding; on the sheep not being allowed to tear the fleece amongst brambles and hedges; on not getting burrs, chaff, and other foreign matters adhering to the wool; on the sheep being properly washed before shearing;[1] and on all

[1] With coarse low priced wools, like the Scotch Blackfaced, it is different. They are chiefly used in carpet manufacture, and, as colour is not so important, there is less difference in the price of washed and unwashed in their case than in

sheep that require it being carefully tagged or docked before washing, and again before shearing.

Care and watchfulness on one and all of these points are absolutely necessary if the wool is to be brought to market in first-rate condition.

Getting-up the wool to the best advantage, and sorting it properly, thus means much more than the mere handling of it after it comes off the sheep. It begins with the conditions under which the sheep are reared and the wool grown.

However low prices may fall, the best price of the day will always leave a fair margin for profit to the grower; but in order to command the maximum price, the wool must not only be of the best quality, it must also be in the best condition; or, in other words, it must be made as marketable as possible. In wool, as in other things, the more perfect its state when put upon the market the more valuable it is.

Anything that will raise the character and reputation of the wool, and will give satisfaction to the manufacturer, must be of benefit to the grower.

Wool at Shows.

The whole subject of wool at shows will sooner or later have to be taken up on new lines. In one branch only, and that its least important one—the art of getting up the fleeces of show sheep—has wool been studied with care and shown to the best advantage. But, as an essential integrant, it may be said that in the general sheep classes at all our shows wool has counted for little or nothing in the majority of awards. And as a special exhibit, alike in fleece form and on the sheep's back, wool has never received anything like the attention it deserves.

Our agricultural societies are not to blame for this neglect. By the very nature of their constitution they exist to voice the practice and opinions of exhibitors and farmers generally; and if sheep-breeders had shown a more zealous interest about wool, it would have occupied a more prominent place in our showyards than it does to-day.

the finer breeds of wool. But there is another good commercial reason why Scotch Blackfaced wool is not washed. Large quantities of it are exported to America, where carpet wools are admitted at a duty of 2½ cents on wool costing less than 6d. per lb., and 5 cents on wool costing more than 6d. Thus, it does not pay to wash a 5d. wool under the circumstances, as to do so would bring the cost above 6d., and make it chargeable with the higher duty. The Scotch Blackfaced, however, is the only wool which goes from this country under the head of "carpet wool." All other sorts exported to America are charged 10 cents per lb. duty, washed or unwashed, and wool-growers do not need to be told that buyers who have 5d. per lb. duty to pay will prefer to pay it on wool and not on dirt.

Wool on Show Sheep generally.

In the general sheep classes at shows, wool, as a rule, gets little attention, unless it stands well up and gives the appearance of perfect form and substance to a sheep. But if a fleece of this kind cannot be produced without the wool being coarse and strong, it should have no chance against a fine-woolled fleece. No doubt wool is of more value in some breeds than in others. In all show sheep, however, it should get the same consideration as mutton qualities. This will never be done until there are fixed points for wool. It may be necessary to vary the number of points given for it in different breeds, but in no case should wool be given less than 25 points in the judge's scale-card.

Length of Wool on Show Sheep.—It is in regard to this point chiefly that wool has hitherto attracted much notice at shows. The rules in force as to the date of shearing show sheep are not strictly observed by all exhibitors, and it is quite impossible for any judge or wool inspector to say with certainty that a sheep has not been shorn bare after a given date, the growth of the wool is so much influenced by the way in which the sheep are fed and sheltered. Old wool, however, is most injurious to the appearance of sheep of almost any breed, the long wools especially, and therefore is little seen. It is uneven shearing about which there is most reason to complain. But unevenness in the length of wool on live sheep is easily noticed, and is only met with when there is a foolish attempt on the part of an exhibitor to hide some defective formation in the animal.

Shearing Rules.—The policy of fixing earlier or later dates for shearing show sheep is, to say the least, doubtful. No matter what date is fixed, the rule will be evaded by those who want to evade it. Rules which cannot be enforced are worse than useless; they become mischievous, and deter many would-be exhibitors. If the object of such rules is merely to ensure fair shearing they are not needed, if the standing rule to cast all sheep carrying any old wool, and sheep unevenly shorn, be enforced as it ought to be. Any other consideration that might be urged in favour of restriction as to the date of shearing will not weigh against the general good, which demands that sheep should be shown in full fleece. The glory of a sheep is its wool, and if a long-wool sheep especially is shorn after April 1 or March 1, no intending purchaser, who is a visitor to the show, can form a just estimate of the amount of wool which such a sheep will produce in the natural development of a full-grown fleece. The impression made on the foreigner, no less than on the home purchaser, is one of the things which breeders have to consider in showing sheep. It

says very little for the way this is done when animals which are cultivated specially for wool are shown, every one of them, in half-grown fleeces. If any good reason can be given for shearing particular classes of show sheep, or if there is a desire to see the mutton points bare, let there be separate classes for rough and bare sheep. Or, show all the sheep in full fleece,

(Half natural size.)

Fig. 20.—*A lock of Alpaca.* Fig. 21.—*A lock of Mohair.*

and then let them be shorn bare in the yard, before the judges' awards are made, and the fleeces judged separately as well as the bare sheep, which would then be shown in their true shapes. Sheep are numerous enough for a really good flock to provide fresh specimens for different shows.

Special Prizes for Wool on Sheep.

In this section there ought to be single-sheep entries, as the wool on different sheep in groups varies so much, and a single definite example only can point the instruction needed in regard to the desirable qualities of wool.

There might, with great advantage, be separate classes under this head for—

1. Sheep carrying the best fleece for combing and carding purposes, according to breed and district.
2. Hill sheep carrying the best fleece for outdoor wintering.
3. Sheep of any breed carrying the greatest weight of clean wool in proportion to live-weight of animal—the sheep to be

clipped in the showyard, and both fleece and sheep weighed in presence of the judges.

Judging Wool on Live Sheep.—A good judge of both sheep and wool has communicated the following suggestions for judging wool on live sheep: "Always assuming that the wool to be inspected is really fine, we first examine the shoulders, as the part where the finest wool is to be found. This we take as a standard, and compare it with the wool from the ribs, the thigh, the rump, and other parts, and the nearer the wool from the various portions of the animal approaches the standard the better. First, we scrutinise the fineness, and if the result is satisfactory we pronounce the fleece in respect to fineness very 'even.' Next we scrutinise the length of the staple, and if we find that the wool on the ribs, back, and thigh approximates reasonably in length to that of our standard, we again declare the fleece as regards length of staple 'true and even.' We next satisfy ourselves as to the density of the fleece, and we do this by closing the hand upon a portion of the rump and loin wool, these points being usually the thinnest and most faulty. If this again gives satisfaction we design all the wool 'even as to density.' Now to summarise these separate examinations. If the fleece is nearly of equal length—shoulder, rib, and back—and density on shoulder and across the loins, we conclude that we have a perfect sheep for producing valuable wool."

Prizes for Fleece Wool.

The primary object of giving prizes for fleece wool is to show farmers exactly what class or classes of wool are of most value for manufacturing uses. For this purpose each exhibit should be limited to one fleece; as, if there are three or more fleeces in each exhibit, it may very well happen that the best fleece in the show is not included in the first-prize lot. The exhibition would not then bring home to farmers the lesson it was intended to teach. But while there should only be one fleece in each exhibit in any class, there should be several classes for fleece wool, and separate classes for the wool of each breed of sheep.

Under each of the principal breeds there should be a separate class for—

(1) The best fleece for combing or carding purposes, according to breed and district. (2) The heaviest fleece of any age. (3) The best lamb fleece. (4) The best hogget fleece.

Then there should be general classes for—

(1) The best-conditioned fleece in the show. (2) The heaviest lamb fleece in the show. (3) The heaviest hogget fleece in the show. (4) The best fleece from sheep wintered out of doors. (5) The best fleece from sheep house-wintered. (6) Sorted fleeces.

In the last class the fleeces should be sorted in the showyard by a skilled wool-sorter, and judged after sorting. No special exhibits would be required for sorted fleeces, as one-half of the fleeces in any of the other classes might be sorted, and the other half of the fleece be left lying beside it for comparison.

The sorted fleeces might be made of great educational value to wool-growers, if they were properly displayed after sorting, with the different sorts or qualities in each fleece separated, and the proportional weights and values of each sort to the whole fleece printed on the schedule card attached to each fleece.

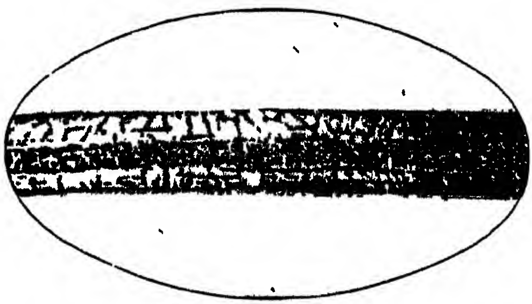


Fig. 22 (magnified 300 times).—*A fibre of Alpaca.* Dia. $\frac{1}{675}$.

With these before him, any farmer might soon become an expert in wool-sorting, and, what is of more consequence, he would acquire a clear knowledge and understanding of the different qualities and values of wool for special and general purposes, and of the kind of wool it would pay him best to grow. Every year, were such competitions continued, it would be found that the proportion of first-class wool in the fleeces would be increased until the highest possible perfection had been reached in that respect. This is what must be done if wool is to be cultivated for all it is worth, or even with the same appreciation with which mutton is now cultivated.

Clip Prizes.

To show the rent-paying character of the wool grown, it is most desirable that there should also be prizes for—

1. The total clip showing the highest average weight per sheep on the farm; and
2. The total clip sold making the highest average price per sheep on the farm.

The competition in these classes should be open to all breeds of sheep; but it might be necessary to impose some limit as to proportionate ages in the flock, or to have separate classes for breeding and feeding flocks.

No exhibits would be necessary for clip prizes. The entry form would simply have to state (1) the total number of sheep clipped on the farm last season, their ages and breeds; (2) the total weight of wool clipped, and the average per fleece; and (3) the total money value of the clip, and the average per fleece. The awards would be made on the wool-buyers' certificate of number of fleeces of each kind and breed, total and average weight of the fleeces, and the price paid for the same.

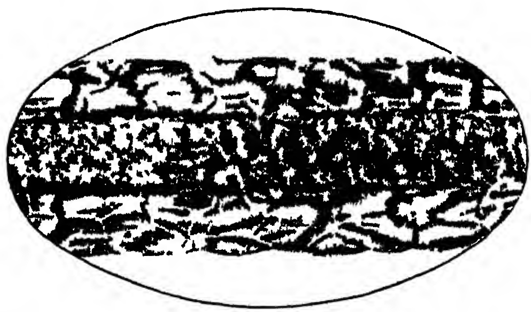


Fig. 23 (magnified 300 times).—*A fibre of Mohair.* Dia. $\frac{1}{100}$.

Such competitions would serve the double purpose of bringing out the best breeds of sheep for weight and value of wool, and of showing farmers what the wool produce of a well-managed flock could be made to reach. The commercial aspects of wool-growing in general could not be so aptly nor so clearly and instructively put in any other way.

Prizes for New Varieties of Wool.

No prize-list for wool at our National Shows can be considered complete without a class for "New Varieties of Wool."

These are as desirable, and as possible, as new varieties of plants, if the conditions of growth were generally as well understood in the one case as in the other. To this end, wool must be studied and experimented on with the same assiduous intelligence.

Skill and industry are requisite for obtaining the finer qualities of wool under any circumstances, and the breeder who succeeds in raising any new and improved variety is deserving of encouragement.

The samples of wool of different breeds illustrated in figs. 1 to 23 were obligingly supplied by Messrs Russell & Ramsden, wool-brokers, Leith, to whom most cordial thanks are here tendered.

SHEEP-FEEDING EXPERIMENT AT CHALLOCH, LESWALT.

By Dr A. P. Aitken, Chemist to the Society.

The feeding experiments made with sheep during the winters of 1896-97 and 1897-98, at Ferney Castle and Whitelaw in Berwickshire, with the object of testing the relative values of various concentrated fodders along with a full allowance of turnips, showed that there was still much information to be acquired on that subject. Accordingly it was resolved to try an experiment of a somewhat similar kind with a different class of stock, and under more commonly occurring conditions, in Dumfriesshire and Wigtownshire. Owing to the comparative failure of the turnip crop in the former county in 1898, the experiment there had to be abandoned, but an experiment on a large scale and under the most favourable conditions was carried out in Wigtownshire by Mr John M'Caig at Challoch, Leswalt, in the Rhins of Galloway.

The stock used for the purpose was a lot of cross-bred lambs, from blackfaced ewes and Border Leicester tups, bred in Macharioch, Cantyre, and bought in Ayr in September 1898. They were "harvested" in Ayrshire, and afterwards on young seeds in Wigtownshire till nearly the end of October, when they were folded on turnips for close on three weeks. Of these, 120 were taken and divided into six lots of twenty each, and from the 19th November 1898, when the experiment began, until its close on 3rd April 1899, a period of nineteen weeks, they were fed in the following manner:—

Lot.
1. Turnips alone.
and maize.
and oats.
and an equal mixture of oats, dried distillery grains, and linseed-cake.
and dried distillery grains.
and linseed-cake.

These concentrated fodders—or by-fodders, as they are more conveniently called—were selected as being likely to yield the most useful information to those farming in the district. During the first half of the time the by-fodders were given at the rate of 10 lb. per lot per day—viz., ½ lb. per head—and during the second half of the time they were given in quantities of equal money value, and as these varied greatly in price, the quantities

consumed per head also differed widely. It will therefore be convenient to consider the effects of the feeding during the first and second periods separately. During both periods the sheep consumed the whole of their by-fodders. They were given as much turnips as they cared to eat, and the quantities consumed by the different lots not only varied considerably, but in a manner which contributes much to the interest and usefulness of the experiment.

General Management.

Before going into details, a few words may be said regarding the general management. The sheep were folded on the turnip-break from which the turnips had been removed, on a field where all the lots were equally exposed to weather influences, and they were shifted on to fresh ground every fifth or seventh day. The feeding-boxes were arranged in a similar manner in each of the folds, and were so extensive as to give an equal chance to all the sheep to obtain their due proportion of turnips and by-fodder. The turnips were sliced and weighed, and a sprinkling of salt put over them when placed in the boxes. Any bits of turnips left over were daily removed and weighed, so that an exact record was kept daily of the weight of turnips eaten by each lot.

The sheep were marked by means of metallic clips on their ears, and these remained fastened quite satisfactorily. They were weighed individually from time to time, according as the occurrence of dry weather rendered the operation practicable—viz., five times during the whole course of the experiment. The entire record of the weighings is given on Tables XV. to XX. at the end of this report, from which it will be seen that the sheep at the beginning had been drawn into six fairly even lots, and that while there are considerable differences in the progress made by individual sheep, yet the large number of twenty in each lot so equalised matters as to make their united weight a reliable measure of the effect produced by the circumstances of its feeding.

Considering the large number of sheep under experiment, there were few failures. In none of the lots did more than two individuals die or take ill, or go wrong in such a manner as to cause them to be removed. In estimating the progress of each lot the number of individuals in each must be the same, and in this case that may be done by cutting out two from each lot and so leaving a uniform number of eighteen, or by crediting those that have been removed with having made progress equal to the average of the rest, and thus regarding the figures for each lot as referring to a score of sheep. I have

chosen the latter method where lots are considered; but in most cases the results are expressed in average values per head, wherein no allowances for accidents of any kind are required.

Progress during the First Period.

From the beginning of the experiment in November till far on in January the weather was unusually wet and stormy at intervals. There was a rainfall of 5·50 inches in November, 4·11 in December, and 3·69 in the first three weeks of January. Then the weather cleared up; dry frosty weather supervened, and on 23rd January the fleeces of the sheep were dry enough to permit of their being weighed. In Table I. are given the weights at the beginning and almost at the end of the first period, and the gain in weight made by each lot.

TABLE I. WEIGHINGS OF SHEEP DURING FIRST PERIOD.

Lot.		Nov. 19.			Jan 23.			Increase per lot in 9 weeks.			Increase per head per week.
		cwt.	qr.	lb.	cwt.	qr.	lb.	cwt.	qr.	lb.	lb
	Turnips alone	12	1	15	14	2	26	2	1	11	1·46
	" and maize	12	1	25	16	0	4	3	2	7	2·22
	" and oats	12	2	23	15	2	6	2	3	11	1·77
	" and mixture	12	2	5	16	0	2	3	3	3	2·35
	" and grains	12	3	10	17	1	8	4	1	26	2·79
	" and linseed-cake	12	1	5	14	1	25	2	0	20	1·36

It is seen that the six lots at the beginning were fairly equal. The slight advantage of lots 4 and 5 is not such as to interfere with the accuracy of the ultimate findings of the experiment. The detailed table of weighings shows that it was not due to these two lots containing a greater number of good feeders, for it is seen, as frequently happens, that some of the leanest of the lot have made the greatest progress.

Very extraordinary differences are noticed in the weight of these lots which started so even in November. The increase varies from 1·35 lb. per head per week in the case of lot 6 to 2·68 lb. per head per week in the case of lot 5. Anything above 2 lb. increase per head per week is very good fattening, and that has been obtained by three of the lots.

Dried grains stand at the head among the by-fodders for sheep, and this is a result that does not come altogether as a surprise, for the results of the former feeding experiments with sheep pointed in that direction. Next comes a mixture of oats, grains, and linseed-cake; and in the third place maize, a well-

recognised and much-used by-fodder for sheep. Only in the fourth place comes oats, which in many districts has been used as the sole by-fodder for sheep, and very frequently the lightest of the oats on the farm has been reserved for that purpose. The most remarkable, and at the same time disappointing, result is that of the linseed-cake lot, which made less progress than lot 1, that had no by-fodder at all. It would seem as if the linseed-cake at the rate of ½ lb. per head per day had done positive harm. That, however, will be more conveniently discussed when we consider the composition of the by-fodders and the effect which their consumption had upon the quantities of turnips consumed.

Analysis of the Turnips consumed.

The turnips given to the stock during the first period were swedes of the following composition:—

Moisture	90·44
Dry matter	9·56
	100·00

The dry matter contained—

Albumen	4·37
Amides, &c.	4·59
* Carbohydrates, &c.	74·47
Fibre	10·52
Mineral matter	6·05

* Including sugar . . . . . .

The oil contained in the swedes, which would amount to about 1 per cent of the dry matter, is included in the carbohydrates. Less than half of the nitrogenous matters consisted of albumen; the rest is included under amides, &c. This, and the comparatively small amount of sugar, shows that the swedes were of rather poor quality and imperfectly ripened, owing, doubtless, to the want of sunshine and to the excess of rain during the autumn. They were only middling well eaten by the stock, and the quantities consumed by the various lots, and the circumstances attended their consumption, form an interesting and instructive part of the experiment.

Quantities of Turnips consumed.

Table II. shows the quantities of turnips consumed during the first period, when the by-fodders were given at the uniform rate of ½ lb. per head daily.

TABLE II. TURNIPS CONSUMED PER HEAD PER DAY—FIRST PERIOD.

No. of days	14	35	14	10	73	
Date.	Nov. 19 to Dec. 3.	Dec. 4 to Jan. 7.	Jan. 8 to Jan. 21.	Jan. 22 to Jan. 31.	Total.	Average.
Lot	lb.	lb	lb	lb.	lb	lb.
1	17·50	17·25	16·25	14·50	1221	16·7
2	14·15	16·85	15·10	13·30	1132	15·5
3	15·50	19·40	15·95	13·85	1258	17·2
4	16·85	19·55	15·80	14·35	1285	17·6
5	17·00	20·50	18·80	14·45	1363	18·7
6	16·10	18·25	16·85	13·10	1231	16·9
Average	16·18	18·63	16·46	13·92		
Kind of weather:	Wet and windy.	Wet and calmer.	Wet and windy.	Dry, cold, & windy.		

The turnips were best eaten from 4th December to 7th January, when the weather, though wet, was comparatively mild—at least during the day, though night-storms were frequent.

The period before and the period after that were wet and stormy. By the 21st January the rain ceased, and a keen frost set in accompanied with strong winds. The immediate effect of the cold frosty winds was to reduce very considerably the amount of turnips eaten. The want of shelter prevented the sheep from standing up at their feeding-boxes with any comfort. The differences in the amount of turnips eaten by the different lots rapidly disappeared during the cold windy weather, and the quantity consumed was evidently regulated by the length of time the sheep were able to stand up against the cold.

Lot 5 dropped in their consumption of turnips to the extent of about 4½ lb. per day, and for the first time for seven weeks lot 1, feeding on turnips alone, ate more turnips than the other lots; the reason being, no doubt, that they were driven to it by hunger. The ½ lb. a-day of by-fodder allowed to the other lots rendered them less dependent on turnips. But it is important to note that in mid-winter nearly all the lots receiving by-fodder ate more turnips than lot 1, despite the fact that their ½ lb. per head of by-fodder contained as much dry matter as would be contained in about 4 lb. of turnips, so that their by-fodder was extra feeding in the strict sense of the term. If the giving of by-fodder were to cause a diminished consumption of turnip, there might be little or no economy in the practice; but it is

clearly shown that the addition of a certain amount of by-fodder not only does not diminish appetite, but in favourable circumstances actually induces the consumption of an increased amount of turnips.

What the precise effect of the diminished consumption of turnips during the cold stormy weather had upon the progress of the sheep it is impossible to say, as they were not weighed often enough to furnish the required data; but it is reasonable to suppose that, had shelter been provided at the boxes, the sheep would have eaten a few pounds more turnips daily, and would have continued to progress at a rate that would have more than repaid the small cost and labour required to provide the needed shelter.

With all deference, and speaking as a layman, I venture to suggest that during stormy weather a cheap and efficient shelter could be achieved by placing the boxes end on to the direction of the wind, and protecting the windward ends by means of about 7-feet lengths of canvas secured to stobs driven into the ground. The expense and trouble involved would not be great, and they could be easily shifted about.

An examination of the table further shows that lot 5, receiving dried grains, which was the bulkiest of the by-fodders, ate most turnips, the amount being about 2 lb. per head per day more than lot 1 that got no by-fodder at all, and that next to it came lot 4, one-third of whose by-fodder consisted of dried grains. What there is in dried grains to cause an increased consumption of turnips is hard to say, but it is probably due to the fact that it was the driest of the by-fodders, and would probably on that account be a more appetising kind of fodder, as being in greater contrast with turnips, whose excess of moisture constitutes their chief defect.

It will be noticed also that lot 2, getting maize as a by-fodder, ate the least turnips. It might seem as if there were something in the maize that disinclined the sheep to eat turnips, or that satisfied their appetite so well as to prevent their eating so much turnip food. Maize is a very hard fodder, and although sheep have a greater power of masticating the hard seeds than possessed by other stock, yet the time spent in the process must be very much prolonged; and the amount of saliva secreted during prolonged mastication would be much greater than in the case of the other by-fodders, and the time spent in grinding maize, and probably in the process of rumination thereafter, would leave less for the consumption of turnips. If that were so, it would doubtless be advantageous to use crushed instead of whole maize. Whatever the reason, the fact that sheep eating maize as a by-fodder consume less turnips is clearly brought out in the first period of this experiment.

Composition of the By-fodders.

A knowledge of the composition of the by-fodders employed will perhaps help to explain some of the peculiarities that have been observed.

TABLE III.—COMPOSITION OF THE BY-FODDERS PER CENT.

	Maize	Oats	Grains.	Linseed cake
Albumen . .	11·15	10·28	19·25	34·78
Oil . . .	4·65	7 23	5·27	8·55
Carbohydrates, &c.	65·63	54·80	50·06	30·31
Fibre . . .	3·20	8·90	11·17	6·62
Moisture . .	13·85	16·47	11·95	14·52
Ash . . .	1 52	2 32	2·30	5·22
	100·00	100 00	100 00	100·00

These would all be described as fodders of good quality. The maize contains less than the average amount of oil, and it might have had 2 per cent more oil with advantage. It is not sufficiently well known that maize fluctuates in its composition more than other grains used in stock-feeding, and this is especially true of the oil it contains. It may contain less than 2 per cent, and sometimes contains more than 9 per cent, while good average maize contains upwards of 6 per cent oil. Considering how important oil is as a constituent of a by-fodder, feeders who use much maize would do well to have their purchases of it brought under analytical control. The same remark applies to oats, though in a less degree. The constituent in oats that varies most is albumen, sometimes falling below 7 per cent and sometimes rising above 18 per cent; and as a good average is 12 per cent, this sample is somewhat deficient in albumen. But the remarkable thing about it is the very high percentage of oil. It is very rarely, indeed, that a sample of oats contains more than 7 per cent of oil, so that the oats used for this experiment contained the maximum of that constituent. The distillery grains were of good average quality. The linseed-cake was exceptionally rich in albumen, and contained less oil than usual.

Food Constituents consumed in By-fodders.

Considering that the quantity of these by-fodders given during the first period of seventy-three days was the same for all—viz., ½ lb. per head per day—the amount of the *food constituents*

consumed by the different lots must have differed widely. The quantities are show in Table IV.

TABLE IV.—FOOD CONSTITUENTS IN BY-FODDERS CONSUMED PER HEAD DURING FIRST PERIOD.

Lot.		Organic matter.	Albuminoids.	Oil.	Carbohydrates	Fibre.
		lb.	lb.	lb.	lb.	lb.
1	None.	...	...	...	...	...
2	Maize . . .	30·9	4·1	1·7	23·9	1·2
3	Oats . . .	29·6	3·7	2·6	20·0	3·3
4	Mixture of 3, 5, 6 .	29·6	7·7	2·5	16·2	3·2
5	Grains . . .	31·3	7·0	1·9	18·3	4·1
6	Linseed-cake . .	29·3	12·7	3·1	11·1	2·4

There is very little difference in the amount of organic matter consumed as by-fodder in the different lots, but the separate constituents have a wide range. The most important are the albumen and the oil, for they are the substances most deficient in turnips. The carbohydrates, on the other hand, though they too differ a good deal, have less importance, inasmuch as the quantities contained in the by-fodders are entirely swamped by the large amount consumed by the sheep in their turnip ration.

Food Constituents consumed in Turnips.

The food constituents contained in the turnips consumed during the first period of seventy-three days vary in amount only according to the differences in the quantity of turnips consumed, and they were as follows:—

TABLE V.—FOOD CONSTITUENTS IN TURNIPS CONSUMED PER HEAD—FIRST PERIOD.

Lot.	Organic matter.	Albumen	Amides, &c	Carbohydrates and oil	Fibre.
	lb.	lb.	lb.	lb.	lb.
1	109·6	5·1	5·4	87·0	12·2
2	101·6	4·7	5·0	80·6	11·3
3	113·0	5·3	5·5	89·6	12·6
4	115·4	5·4	5·7	91·5	12·8
5	122·4	5·7	6·0	97·0	13·6
6	110·8	5·2	5·4	87·6	12·3

In this table there is no separate estimate of oil, for the reason that the amount is exceedingly small—viz., about a

thousandth part of the total weight of turnips consumed. For our purpose it is not worth estimating separately, all the more that considerable error is involved in its estimation according to ordinary methods, including, as it does, other things that are not exactly oil and of doubtful feeding value; so there is no use in making a separate column for it, and thereby affecting a greater amount of accuracy than is attained. The column marked amides, &c., contains all the nitrogenous matter that is not really albumen. These are also of doubtful feeding value, for not only do they contain other things besides amides, but even if they were all amides, their feeding value depends upon a variety of circumstances which need not be considered here.

Total Food Constituents consumed.

In adding together the food constituents of the turnips and by-fodders, the amides had better be kept distinct, although it is usual to slump them in along with the albumen under the name of albuminoids; and as to the oil, it is sufficient to reckon it as one-thousandth of the total turnips consumed.

The combined food constituents of the turnip and by-fodders consumed during the first period of seventy-two days, and the amount of increase of live-weight up to the 23rd January, when the sheep were weighed—viz., a week before the end of the first period—were as follows:—

TABLE VI.—TOTAL FOOD CONSTITUENTS CONSUMED PER HEAD—FIRST PERIOD.

Lot.		Organic matter.	Albumen.	Amides, &c.	Oil.	Carbo-hydrates.	Fibre.	Increased live-weight per head in nine weeks.
		lb.	lb.	lb.	lb.	lb.	lb.	lb.
1	Turnips alone .	109·7	5·1	5·4	1·2	85·7	12·2	13·1
2	" and maize	132·5	8·8	5·0	2·8	103·4	12·5	20·0
3	" and oats .	112·6	9·0	5·5	3·9	108 3	16·0	15·9
4	" and mixture	145·0	13·1	5·7	3·8	106·4	16·0	21·1
5	" and grains	153·7	12·7	6·0	3·3	114·0	17·7	25·1
6	" and linseed-cake	139·8	17·9	5·4	4·3	97·5	14·7	12·2

Fattening Influence of different Food Constituents.

On examining this table in order to discover what was the constituent in the fodders that had most influence in determining the increase in live-weight, we meet with much that is anomalous

and hard to explain. If we take the organic matter as our gauge, as has sometimes been suggested, we find that lot 5, which made the greatest progress, consumed the most organic matter; but it is evident that the great lead which it has taken could not be due to the comparatively small excess of organic matter consumed by it over that of the neighbouring lots, 3, 4, and 6. Moreover, lots 3, 4, and 6 are all about a level as regards the organic matter they consumed, and yet how different is their progress—16 lb., 21 lb., and 12 lb. per head respectively. Lot 2, which was second lowest in the amount of organic matter consumed, was relatively advanced in feeding progress.

It is evident that the mere amount of organic matter consumed is no adequate gauge of progress. We must look to see what the organic matter was composed of. If we take albumen as our gauge, the most glaring anomalies present themselves. Lot 6, that consumed most albumen, made least progress, and lot 1, that consumed less than one-third as much albumen, have done about as badly; and the others have progressed in a manner which shows no relation to the quantity of albumen consumed. The amides, &c., show no noteworthy variation and explain nothing, and it is a matter of indifference whether we include them with the albumen or not. As to the oil, it follows the same relation as the albumen, and is equally untrustworthy as a gauge of progress.

The carbohydrates consumed vary in harmony with feeding progress better that the other constituents; but whether we consider them alone or in conjunction with the fibre, to which they are closely related, the differences in the amounts consumed by the different lots are so slight and so irregular as to form no gauge whatever of feeding progress.

Poor Result from Linseed-cake.

Albumen and oil are the two constituents that are chiefly bought into the farm and chiefly valued for extra feeding, and nine or ten weeks ought to be a sufficient time to enable them to produce their beneficial effects; but in this experiment, carefully carried out under most favourable conditions, we are presented with the fact that lot 6, that got most albumen and oil, did worst of all—worse even than lot 1, that got no extra feeding whatever. How are we to explain this most unexpected result? Nothing seemed to go wrong with the sheep; no scouring was noticed, but simply they didn't thrive any better than lot 1. They had, as Mr M'Caig expresses it, "a washed-out appearance," and it is of course certain that they were not properly digesting their linseed-cake. It was a cake containing nearly 35 per cent of albumen, while average linseed-cake con-

tains only about 28 per cent; and it would seem that ½ lb. per day of a by-fodder so highly nitrogenous was too much for them, and they may all have been suffering slightly, though not visibly, from indigestion. Had the dung of the various lots been analysed from time to time, it would doubtless have been found that in the case of lot 6 it was richer in albumen, and probably also in oil, than the others, showing that the cake was passing through them in great measure undigested. It is not the total amount of albumen or other food constituent consumed that determines the progress of feeding animals, but only the amount that is digested, and we should require to know the amounts of the food constituents digested before using any of them as a gauge of feeding progress.

That is quite evident and easily said, but how are we to know how the various constituents are being digested? The only reliable way is by means of analyses conducted with that object in view. There are tables published, such as Wolff's tables, giving what have been found to be the maximum and minimum digestibility, and also a fair average value of digestibility, of most fodders; but it is evident that the average, or even the minimum, value for linseed-cake would have been far wrong in the case before us. The digestibility of fodders varies within wide limits, according to a number of circumstances, even when digestion is going on in a normal way, as is assumed in the tables referred to; but in the case of lot 6 digestion was evidently not going on in a normal way, and any published coefficients of digestibility would be entirely inapplicable. It is evident that the cake given to lot 6 during these nine weeks meant money thrown away, at least as regards fattening—and this conveys a very useful lesson, for the practice of giving linseed-cake to sheep at the rate of ½ lb. per head per day is a very common one, and in ordinary practice the feeder has no means of knowing whether the cake is serving the purpose of fattening the stock or simply that of manuring the land.

It is probable that if lot 6 had received only half as much cake they would have done much better. There is no direct proof that such would have been the case, but we are justified in inferring it from the progress made by lot 4, whose by-fodder consisted of a mixture of equal parts of oats, grains, and linseed-cake, at the rate of ½ lb. per head per day. This lot did better than lot 3, and far better than lot 6, which would seem to show that the smaller amount of linseed-cake consumed was better digested.

Maize.

An examination of Table VI. shows that lot 2, that got maize, made third-best progress. It was evidently well-digested, but

whether that was due to the inherent qualities of the maize or to the increased amount of saliva resorbed in its consumption is hard to say.

Oats.

The poor progress made by lot 3, fed on oats, was not unexpected. It is simply a confirmation of the results obtained in former experiments. The superiority of maize over oats is very marked, showing that there is no economy in using oats as by-fodder if maize can be bought as cheaply, and that the practice is a very extravagant one when, as in this instance, maize can be bought at three-quarters of the price of oats. The deficiency of lot 3 would doubtless have been more marked if, as in ordinary circumstances, an inferior quality of oats had been employed.

The most successful By-fodder.

But the most valuable piece of information conveyed by this experiment is seen in the progress made by lot 5, that received ½ lb. per head daily of dried grains. It was at once the cheapest and most successful of all the by-fodders. As has already been observed, that lot consumed the most turnips; but the superior progress made cannot be accounted for by the increased quantity of turnips eaten.

Its superiority over lot 2 might perhaps be accounted for in that way, as that lot ate least turnips; but its superiority over lot 3 must be put chiefly to the credit of the dried grains.

Progress during the Second Period.

At the beginning of February the amounts of the by-fodders were altered in such a manner that each lot received quantities of equal money value. Lot 3, that had hitherto received daily 10 lb. of oats, now got 15 lb.—viz., ¾ lb. per head—and the price of the 15 lb. oats regulated the quantities of all the other by-fodders. Oats at 42 lb. per bushel were selling at the time at 2s. 2d. per bushel, so that 15 lb. cost 9¼d. The quantities of the other by-fodders that could be got at the time for that money were as follows:—

	lb.
Maize	18
Oats . .	15
Oats, grains, linseed	15½
Dried grains . Linseed-cake .	20¼

The by-fodders were given to the respective lots in these increased quantities. As regards the linseed-cake, there was

scarcely any increase, and that was fortunate, seeing that that lot had been getting rather much already; but the quantity of maize was nearly doubled, and that of dried grains was even more than doubled, and the others were increased by about a half.

The sheep were weighed on 25th February and again on 3rd April, with the following results:—

TABLE VII. WEIGHINGS OF SHEEP—SECOND PERIOD.

Lot.		Jan 23.			Feb. 25.			April 3.			Increase per lot in ten weeks.			Increase per head per week.
		cwt.	qr.	lb.	cwt.	qr.	lb.	cwt.	qr.	lb.	cwt.	qr.	lb.	lb.
1	Turnips alone	14	2	26	15	0	25	16	3	12	2	0	14	1·19
2	" and maize	16	0	4	16	3	0	18	2	10	2	2	6	1·43
3	" and oats	15	2	6	15	3	1	17	1	3	1	2	25	·97
4	" and mixture	16	1	8	17	0	0	19	1	14	3	0	6	1·71
5	" and grains	17	1	8	18	2	9	20	3	1	3	1	21	1·92
6	" and linseed-cake	14	1	25	16	3	1	18	1	9	3	3	12	2·16

The increase in weight during the second period of ten weeks is not so great as during the first period of nine weeks in any of the lots except one—viz., lot 6, which remained so backward previously. It would seem that this lot had now grown accustomed to the linseed-cake and were able to digest it, and as they were leaner than the others, they advanced rapidly; nevertheless, not so rapidly as lot 5 did during the first period.

It might have been expected that the other lots, receiving as they did a greatly increased allowance of by-fodder, would have made better progress. That they did not do so is accounted for in two ways: in the first place, they were growing fat, and according as fattening goes on every pound of increase is laid on with increasing difficulty; but the main reason was the occurrence of cold stormy weather, which prevented the sheep from consuming as much turnip as previously, and as they would have done in circumstances of greater comfort. It may be, also, that the turnips were not quite so inviting. They were supplied with swedes from another field during the second period, and though they differed very little from the former supply in composition, they may not have been relished so much. The following was their analysis:—

Moisture	90·48
Dry matter	9·52
	100·00

The dry matter contained–

Albumen . .	3·93
Amides, &c. .	4·82
* Carbohydrates, &c. .	77·03
Fibre . .	9·25
Mineral matter .	4·97
	100·00
* Including sugar	53·0

They contained somewhat less albumen and more amides, &c., than the former supply, and the same amount of sugar, which shows that they were not quite so well ripened.

TABLE VIII.—Turnips consumed per Head per Day—Second Period.

No. of days:	9	16	13	14	11	10	73	
Date:	Feb. 1-8.	Feb. 9-24.	Feb. 25 to March 9.	March 10-23.	March 24 to April 3.	April 4-14.	Total.	Average.
Lot.	lb.	lb	lb.	lb.	lb.	lb.		
1	16·00	15·00	16·15	14·00	13·25	15·35	1089	14·9
2	15·30	10·75	15·25	11·75	18·75	17·50	1054	14·4
3	13·70	10·00	11·85	10·30	14·75	12 75	871	11·9
4	14·65	10·80	14·70	13·10	20·30	19·55	1091	15 0
5	14 90	12 95	15·00	13·60	20·60	(15·30)	1106	15·1
6	13 60	11·25	13·70	11·90	18 45	19·25	1043	14·3
Average	14·7	11·8	14·4	12·4	17·7	16 6		
Kind of weather:	Dry and cold.	Cold and stormy.	Cold winds.	Stormy.	Wet and mild.	Wet and mild.		

Consumption of Turnips.

February was a dry month with 2·56 inches of rainfall, March was dry and stormy with only 2·34 inches of rainfall; but in April the weather was mild, and the rainfall rose to 3·95 inches. The average amount of turnip eaten during these months reflects very accurately the kind of weather prevailing at the different periods: whenever cold winds blew the consumption fell off, as the sheep could not stand long enough at their boxes, but immediately on the occurrence of mild wet weather the consumption rose with a bound, so that the sheep ate nearly half as much again. This confirms what was observed in the first period, and adds additional force to the recommendation to provide shelter at the feeding-boxes.

During the mild wet weather in April the sheep ate as much

turnip as they did at the beginning of the experiment. Again it is noticed that during severe weather lot 1, getting no by-fodder, ate most turnips; but when mild weather set in they fell off somewhat in their eating, while the others, despite their largely increased consumption of by-fodders, ate more turnips than ever. This was especially the case with lots 4 and 5, consuming dried grains. In the last period lot 5 shows a sudden falling off in the amount of turnip eaten; but this was due to an entirely exceptional circumstance. That lot had on this one occasion been shifted on to another field—a somewhat low-lying field—and immediately thereafter a spell of very wet weather set in, during which the park the sheep were folded on became flooded, and this interfered with their feeding for some days. As soon as they were removed to a drier place, their consumption of turnips assumed its normal amount. This was the only occasion during the whole experiment in which one of the lots (lot 5) was subjected to conditions of an exceptional kind.

The lot that ate least turnip during the first period was lot 2, that got maize; but during the second period it was lot 3, that got oats as a by-fodder. The drop in their consumption of turnip is very marked. The oat-fed sheep did not recover their appetite for turnips as those of the other lots did when the milder weather set in towards the close of the experiment; and for some reason which I cannot explain, it would seem that sheep getting ¾ lb. of oats per head per day have comparatively little appetite for turnips. The other lots all consumed pretty nearly the same amount of turnip during the second period.

Consumption of Food Constituents in Second Period.

The amounts of the food constituents in the turnips consumed by the various lots during the second period of seventy-three days were approximately as shown in Table IX., and the amounts consumed in the by-fodders in Table X., and the total amount of food constituents consumed in the second period in Table XI.

TABLE IX.—FOOD CONSTITUENTS IN TURNIPS CONSUMED PER HEAD—SECOND PERIOD.

Lot	Organic Matter	Albumen.	Amides, &c.	Carbo-hydrates, &c.	Fibre.
	lb.	lb.	lb.	lb.	lb.
1	98·5	4·0	4·9	79·8	9·8
2	95·4	3·9	4·7	77·3	9·5
3	78·8	3·2	3·9	63·9	7·8
4	99·4	4·1	4·9	80·5	9·9
5	100·1	4·1	5·0	81·1	9·9
6	94·4	3·9	4·7	76·4	9·4

TABLE X.—FOOD CONSTITUENTS IN BY-FODDERS CONSUMED PER LOT—SECOND PERIOD.

Lot.	Organic Matter.	Albumen.	Oil.	Carbo-hydrates.	Fibre.
2	55·6	7·3	3·1	43·1	2·1
3	44·5	5·6	4·0	30·0	4·9
4	46·5	11·2	3·8	26·3	5·2
5	63·6	14·3	3·9	37·1	8·3
6	31·5	13·6	3·4	11·9	2·6

TABLE XI.—TOTAL FOOD CONSTITUENTS CONSUMED—SECOND PERIOD.

Lot.		Organic Matter.	Albumen.	Amides.	Oil.	Carbo-hydrates.	Fibre.	Increased live-weight per head in ten weeks.
		lb.	lb.	lb.	lb.	lb.	lb.	lb.
1	Turnips alone .	98·0	4·0	4·9	1·1	79	10·0	11·9
2	" and maize	151·5	11·2	4·7	4·2	119	12·0	11·3
3	" and oats .	123·3	8·8	3·9	4·9	93	13·0	9·7
4	" and mixture	145·9	15·3	4·9	4·9	106	15·0	17·1
5	" and grains	163·7	18 4	5·0	5 0	117	18·0	19·2
6	" and linseed-cake	125·9	17·5	1·7	4·1	87	12·0	21 6

Progress in Second Period.

The slower progress made during these ten weeks than that made during the previous nine weeks was due, in the first place, to the diminished quantity of turnip eaten while the severe weather lasted, and secondly, but chiefly, to the fact that the sheep were growing fat, and therefore adding to their live-weight with increasing difficulty.

The lot that fell off quickest was lot 3, that got oats. They ate half as much oats again as they did during the first period, but their refusal to eat their proper share of turnip greatly interfered with their progress.

Progress from Maize and Linseed-cake.

Lot 2 consumed nearly as much turnip during the second period as during the first, despite the fact that they were eating nearly double their former quantity of maize; but, for all that, the falling off in their rate of progress during the second period was very marked. Perhaps we are here presented with a fact worth knowing—viz., that maize exerts its fattening properties very rapidly at first and only slowly thereafter. If that is so, it

would be good practice to use it during the first stage of feeding, and gradually replace it by some more suitable by-fodder. If we may rely on the results attained by lot 6, there is a very distinct indication of what that by-fodder should be. The sheep of lot 6 made apparently no use of their linseed-cake during the first period; but during the second period they progressed with exceptional rapidity, gaining at the rate of over 2 lb. per head per week. It would seem, therefore, that the effect of linseed-cake is the converse of that of maize, and that very good results might be got by feeding sheep first on maize and mixing or replacing it thereafter with linseed-cake.

The by-fodders used in this experiment were selected at the beginning, and remained unchanged, except as regards quantity, during the whole course of the experiment; but the experience of skilful feeders has shown that the diet of fattening stock may be gradually changed with advantage, and that towards the close of the fattening period a by-fodder rich in albumen and also moderately rich in oil is productive of the best results. Among such by-fodders linseed-cake takes a very high place, and I have no doubt that a further series of experiments, having for its object to show the effects of a judicious variation in the composition of the by-fodders as the feeding progressed, would yield valuable information.

Rate of Progress.

At the foot of Tables XV. to XX., giving the individual weights of the sheep, are given the average individual weight of each lot on the five occasions on which the sheep were weighed. These form an interesting group, and as they are apt to be overlooked, I have gathered them together in a separate table, so as to show at a glance the progress of each lot, and also the general progress made by the entire six scores during the winter.

TABLE XII.

Lot.	Nov 19	Jan. 23.	Feb. 25.	April 8.	April 15.
	lb.	lb.	lb.	lb.	lb.
1	69	82	85	94	95
2	70	90	94	104	108
3	71	87	88	97	96
4	70	91	95	108	106
5	72	97	104	116	118
6	69	81	94	103	105
Average .	70	88	93	104	105
No. of days . .		63	33	35	14
Increase . . .		18	5	11	1
Increase per week .		2·0	1·0	1·6	0

It is seen that during the first nine weeks the sheep over all made very good progress—viz., 2 lb. per week when the weather, though wet, was comparatively mild. During the five weeks which followed the weather was cold and stormy, a great fall occurred in the quantity of turnips eaten, and, despite the increased amount of by-fodder consumed, they made only half their former progress. During the next period—from February 25 to April 3—the weather slowly improved, and became fine during the last ten days or so, and as by this time the sheep had become accustomed to their increased ration of by-fodders, and resumed eating their full supply of turnips, a very great improvement took place in their progress. These results bring into prominence how greatly the progress of feeding stock is dependent on the weather, and show the importance of supplying shelter wherever it can be economically done.

By the beginning of April the experiment may be regarded as having come to an end. The feeding was continued for a fortnight longer; but it will be seen from Tables XV. to XX., giving the weighings of the individual sheep, that no further progress was made, and that in many cases ground was lost. Differences of a pound or two in the weight of sheep, especially when they are unshorn, may occur quite irrespective of their feeding progress, and it is to prevent error in that respect that it is necessary to have about a score of individuals in each lot. This has been so frequently and so clearly brought out in previous experiments, that it becomes a duty to warn all who desire to carry on feeding experiments with sheep to operate on lots of not less than a score each, otherwise the results obtained cannot be regarded as trustworthy.

The True Test of Progress.

The true test of actual feeding progress is, of course, the final weight of carcasses, &c.; but even that test is apt to be misleading in an experiment where the relative efficacy of different feeding stuffs is on trial. What is desired to be known is not only the ultimate effect of the feeding stuffs, but the rapidity with which they attain the end which the feeder desires. Before sending his sheep to the butcher the experimenter naturally waits until they are matured. But some lots mature more rapidly than others, and it may be inconvenient to dispose of the lots piecemeal, and consequently the period of the experiment is extended to enable the more backward lots to improve, whereby all the sheep may be sold together and be weighed as carcasses upon the same day. That is what actually occurred in the present

instance. The date of despatching the sheep to London was postponed a few weeks on account of the unripe condition of the poorer lots, and as a consequence the differences due to the effects of the by-fodders lost some of their sharpness. It would evidently have been a fairer test if each lot of sheep had been slaughtered as soon as it was considered ready, and perhaps it would have been even more satisfactory if a weekly draught of mature sheep had been made from each lot during the last few weeks of the experiment. These considerations cause one to attach considerable value to the live-weighings during the course of the experiment, and especially to those which occurred during the first half of the time.

Food Consumed and Increase in Live-weight.

Naturally, however, the reader will be chiefly interested to know what is the upshot of the whole experiment both as regards live-weight and carcass. On Table XIII. are shown the entire food constituents consumed by each lot during the nineteen weeks in which the experiment may be said to have lasted. It will be seen from it that the dried-grains lot (No. 5) take a long lead; that lot 4, getting a mixture of grains, linseed-cake, and oats, come in easily second; and that lot 2, getting maize, and lot 6, getting linseed-cake, come in equal third. The oats lot (3) take the fifth place, and are not very far in front of lot 1, that got no extra feeding whatever.

An examination of the table will show, as has been already pointed out in a previous part of this report, how slender and uncertain is the connection between the quantity and character of the food constituents consumed and the increase of live-weight attained by their consumption; and, notably as regards the oats-fed lot (3), it is seen that although that lot consumed twice as much albumen and four times as much oil as lot 1, it made comparatively little additional increase, while the neighbouring lot (2), consuming maize, which provided only a little more albumen and somewhat less oil than lot 3, made very satisfactory increase. The explanation is doubtless in great measure to be found in the greater digestibility of their constituents and of the carbohydrates and fibre of maize, both of which have been found in many experiments to possess a remarkably high ratio of digestibility; but it may be that there are other causes of a physiological kind operating with which we are unacquainted, causing stock to thrive better on some fodder than on others, irrespective of their analysis, digestibility, and nutrient ratio.

TABLE XIII.—FOOD CONSTITUENTS CONSUMED DURING ENTIRE EXPERIMENT AND TOTAL INCREASE IN LIVE-WEIGHT.

Lot.		Organic matter.	Albumen.	Amides.	Oil.	Carbo-hydrates.	Fibre.	Increase in live-weight in 19 weeks.	Increase per head per week.
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1	Turnips alone	208	9·1	10·3	2·3	164	22	25 0	1 31
2	" and maize	284	20·0	9·7	7·0	223	24	31·3	1·80
3	" and oats	266	17·8	9·4	8·8	201	29	25·6	1·35
4	" and mixture	291	28·4	10·6	8·7	212	31	38·2	2·01
5	" and grains	317	31·1	11·0	8·3	231	36	41·3	2·33
6	" and linseed-cake	266	35·4	10·1	8·7	185	27	33·8	1·78

Dead-weight.

On 19th April the sheep were killed and their carcasses sent to London, where they were weighed by the consignees, and in Table XIV. are given these weights, and also the average weight of tallow and skins per head of each lot.

TABLE XIV.

Weights per head of Carcass, Tallow, and Skins.

Lot.		Carcass	Tallow.	Skins.
		lb.	lb.	lb.
1	Turnips alone	48·9	4·5	13·1
2	" and maize	58·3	5·6	14·7
3	" and oats	53·2	5·6	14·1
4	" and mixture	58·4	5·3	15·0
5	" and grains	62·8	6·7	16·6
6	" and linseed-cake	58·4	5·0	15·0

These results confirm in the main those contained in Table XII., showing that when so many as a score of sheep are contained in each lot it is possible to trust to the general accuracy of the live weighings. The only case in which there is a slight discrepancy is in lot 4, which, though retaining the second place throughout, is in the end found to be no better than lots 2 and 6. The final almost level character of these three lots, which during the course of the experiment differed so widely, is not the least remarkable feature of the experiment. That lot 4 has been overtaken by lots 2 and 6 is due to the curious circumstance that during the last fortnight that lot lost ground while the others were still slowly progressing. The extent to which this occurred is seen in Table XVIII., where

the individual weighings are recorded. Had the sheep been killed a fortnight sooner there need be no doubt that the dead-weights would have been found to conform very regularly with the live-weights of that date. A practical explanation of the improved position of lot 6 is also to be found in the fact that sheep No. 6 of that lot was so lean that it was not sent to London but retained to take its place among the store sheep of the farm, and the average dead-weight is taken from those that remained. For a similar reason the dead-weight of lot 3 is higher than it ought to be, for in that lot two of the sheep (Nos. 6 and 7) were too lean to kill for London, and therefore the average dead-weight of lot 3 is about 1½ lb. higher than it otherwise would have been. On the other hand, lot 2 (maize) would doubtless have come out second best as regards dead-weight had sheep No. 4, that went sturdy, not been included among the carcasses sent to London. It may be worth noting that lot 2 (maize) was the only lot in which every sheep that was put on to feed lived through the experiment.

Before dismissing this very carefully carried-out experiment, there are a few other points that may be considered. It will be seen that the quantities of tallow got from the different lots are not in correspondence with the relative weights of carcass. Roughly speaking, the tallow weighs one-tenth of the dressed carcass. It is rather less in the case of lot 1, that got no by-fodder, and a good deal less in the case of the linseed-cake lot (lot 6). The proportion is higher in the case of the grains lot (5) and the oats lot (3). Not only is the proportion of loose fat greater in the case of the oats-fed lot, but the actual amount of tallow got from it is surpassed only by the grains-fed lot. This has been observed before in the experiments at Ferney Castle and Whitelaw in 1897,[1] and it may be regarded as ascertained by these experiments that a marked characteristic of feeding with oats is to unduly increase the proportion of tallow produced. It would seem, however, from this experiment that linseed-cake, despite the large amount of oil it contains, tends to diminish rather than to increase the proportion of tallow. The characteristic of linseed-cake and of other highly nitrogenous by-fodders is to stimulate the growth of skin and wool. In this experiment the wool was not separately determined; but the weight of skins produced probably gave a good indication of what the relative weights of wool would have been had the sheep been shorn before slaughter.

The salesmen in London to whom the carcasses were sent—Messrs Samuel Matthews & Son and Messrs Alfred Wilson & Sons—to whom we are indebted for the final weighings, took a personal interest in the experiment. They were asked to give their opinion as to the quality of the mutton, without having

[1] Transactions, 1898, p. 287.

been told how each lot was fed, and they had no hesitation in deciding that lot 2 was the best fleshed lot and the dried grains lot came next. That also was the opinion formed by the local butchers who prepared the carcasses.

TABLE XV.—LOT 1. TURNIPS ALONE.

No.	Nov. 19.	Jan. 23.	Feb. 25.	April 3.	April 15.
	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.
1	2 16	2 24	3 0	3 8	3 0
2	2 26	3 0	3 0	3 4	3 20
3	2 24	3 6	3 10	3 10	3 12
4	2 16	2 26	3 0	3 10	3 8
5	2 16	2 20	2 20	3 6	3 0
6	2 15	3 0	3 10	3 7	3 10
7	2 8	3 0	3 0	3 7	3 4
8	2 12	3 6	3 4	3 23	3 16
9	2 15	2 20	3 0	2 18	...[1]
10	2 24	3 0	3 12	3 20	3 24
11	2 15	2 26	3 4	3 16	3 19
12	2 8	2 24	3 0	3 12	3 4
13	2 10	3 0	2 24	3 8	3 0
14	2 12	2 24	3 0	3 8	3 4
15	2 8	2 24	2 26	3 16	3 12
16	2 8	3 10	3 17	1 0 0	1 0 0
17	2 8	2 24	3 0	3 10	3 12
18	2 8	2 24	2 10	3 0	...[1]
19	2 8	2 24	3 0	3 19	3 26
20	2 10	2 24	3 0	3 6	3 6
Average .	2 $13\frac{1}{3}$	2 $26\frac{1}{2}$	3 $1\frac{1}{4}$	3 $10\frac{2}{3}$	3 $11\frac{1}{2}$

[1] Nos. 9 and 18 went wrong and had to be removed.

TABLE XVI.—LOT 2. TURNIPS AND MAIZE.

No.	Nov. 19.	Jan. 23.	Feb. 25.	April 3.	April 15.
	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.
1	2 10	3 8	3 14	1 0 0	1 0 0
2	2 10	3 4	3 12	3 24	1 0 0
3	2 14	3 5	3 6	3 14	3 18
4	2 24	3 2	3 8	3 20	1 0 0
5	2 16	2 20	3 0	3 5	2 21[1]
6	2 16	3 8	3 18	3 20	1 0 0
7	2 12	3 8	3 20	3 18	3 20
8	2 6	3 0	3 0	3 7	3 12
9	2 15	3 8	3 16	1 0 0	1 0 12
10	2 8	3 12	3 12	3 24	1 0 0
11	2 8	3 9	3 12	3 20	3 16
12	2 4	3 5	3 8	3 18	3 26
13	2 12	3 9	3 8	3 24	1 0 0
14	2 12	3 10	3 8	3 20	3 20
15	2 20	3 8	3 23	1 0 0	1 0 20
16	2 20	3 0	3 4	3 18	3 16
17	2 20	3 8	3 7	1 0 0	1 0 0
18	2 22	3 5	3 4	3 19	3 16
19	2 6	3 5	3 10	3 27	1 0 6
20	2 22	3 10	3 6	3 12	3 18
Average .	2 $13\frac{4}{5}$	3 $5\frac{4}{5}$	3 $9\frac{4}{5}$	3 20	3 $23\frac{1}{2}$

[1] No. 5 went sturdy, but it was kept on with the others and killed for London.

TABLE XVII.—Lot 3. Turnips and Oats.

No.	Nov. 19.	Jan. 23.	Feb. 25.	April 3.	April 15.
	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.
1	2 12	3 0	3 0	3 12	3 4
2	2 21	3 8	3 0	3 12	3 10
3	2 12	3 14	3 12	3 22	3 24
4	2 17	3 0	3 0	3 12	3 16
5	2 12	2 26	3 0	3 8	3 0
6	2 6	2 20	2 12	2 10	2 8[1]
7	2 6	2 20	2 14	3 4	2 20[1]
8	2 8	3 8	3 0	3 12	3 6
9	2 17	2 21	3 0	3 12	3 12
10	2 17	3 16	3 22	1 0 0	1 0 0
11	2 10	..	..	...	...[2]
12	2 17	3 9	3 12	3 20	3 18
13	2 17	3 4	3 8	3 20	3 18
14	3 0	3 18	3 24	1 0 0	3 26
15	2 12	2 18	2 18	2 8	.[2]
16	2 18	2 26	3 0	3 2	3 0
17	2 16	3 2	3 7	3 21	1 0 0
18	2 11	3 10	3 20	3 22	3 22
19	2 20	3 4	3 8	3 18	3 22
20	2 20	3 0	3 8	3 24	3 20
Average .	2 15⅙ [?]	3 3	3 4¼ [?]	3 12¼ [?]	3 12½

[1] Nos. 6 and 7 were so lean that they were not killed but disposed of as stores.
[2] Nos. 11 and 15 died.

TABLE XVIII.—Lot 4. Turnips and a Mixture of Oats, Dried Grains, and Linseed-cake.

No.	Nov. 19.	Jan. 23.	Feb. 25.	April 3.	April 15.
	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb
1	2 16	3 6	3 7	3 26	3 24
2	2 12	2 26	2 27	3 4	3 0
3	2 12	3 6	3 12	1 0 0	1 0 6
4	2 16	3 3	3 0	3 12	3 18
5	2 14	3 10	3 12	3 26	3 22
6	2 14	3 7	1 0 4	1 0 12	1 0 14
7	2 6	...	..	..	...[1]
8	2 21	...	...	...	...[1]
9	2 24	3 16	3 8	3 18	3 12
10	2 12	3 8	3 18	3 27	3 22
11	2 20	3 12	3 24	1 0 14	1 0 14
12	2 17	3 12	3 16	1 0 14	1 0 10
13	2 6	3 6	3 12	3 24	1 0 0
14	2 16	3 0	3 4	3 16	3 14
15	2 14	2 25	3 8	3 16	3 10
16	2 14	3 0	3 8	3 12	3 12
17	2 12	3 4	3 4	3 12	3 6
18	2 12	3 18	3 18	1 0 8	1 0 0
19	2 12	3 20	3 16	1 0 8	1 0 12
20	2 12	3 10	3 4	3 24	3 12
Average .	2 14¼ [?]	3 6¼ [?]	3 11¼ [?]	3 24½	3 22½

[1] Nos. 7 and 8 died.

TABLE XIX.—Lot 5. Turnips and Dried Distillery Grains.

No.	Nov. 19.			Jan. 23.			Feb. 25.			April 3.			April 15.		
	cwt.	qr.	lb.	cwt.	qr.	lb.	cwt.	qr.	lb.	cwt.	qr.	lb.	cwt.	qr.	lb.
1		2	6		3	0		3	0		3	12		3	12
2		2	6		...			...			...			...[1]	
3		2	22		3	10		3	18	1	0	0		3	26
4		2	12		...			...			...			...[1]	
5		2	16		3	14	1	0	0	1	0	8	1	0	8
6		2	14		3	0		3	24	1	0	4	1	0	8
7		2	9		3	20	1	0	0	1	0	14	1	0	16
8		2	24		3	10		3	12		3	24		3	22
9		2	9		3	10		3	22	1	0	0	1	0	0
10		2	9		3	12		3	24	1	0	12	1	0	12
11		2	24	1	0	0	1	0	12	1	0	17	1	0	22
12		2	24		3	8		3	12		3	24		3	20
13		2	16		3	10		3	6	1	0	0	1	0	0
14		2	22		3	8		3	18	1	0	0	1	0	0
15		2	5		3	14		3	24	1	0	10	1	0	16
16		2	23		3	14		3	12	1	0	0	1	0	0
17		2	8		3	24	1	0	0	1	0	16	1	0	18
18		2	26	1	0	0	1	0	5	1	1	0	1	1	9
19		2	27		3	10		3	18	1	0	0		3	21
20		2	16		3	14		3	14		3	20	1	0	0
Average .		2	16		3	13		3	20	1	0	$1\frac{1}{4}$	1	0	$5\frac{2}{3}$

[1] Nos. 2 and 4 died.

TABLE XX.—Lot 6. Turnips and Linseed-cake.

No.	Nov. 19.			Jan. 23.			Feb. 25.			April 3.			April 15.		
	cwt.	qr.	lb.	cwt.	qr.	lb.	cwt.	qr.	lb.	cwt.	qr.	lb.	cwt.	qr.	lb.
1		2	16		3	16		3	22	1	0	0	1	0	0
2		2	16		2	26		3	0		3	13		3	12
3		2	16		2	28		3	11		3	22		3	18
4		2	4		2	16		3	6		3	13		3	20
5		2	4		2	11		2	26		3	4		3	8
6		2	4		2	14		2	24		2	22		2	12[1]
7		2	6		2	18		3	5		3	20		3	16
8		2	7		2	12		3	0		3	9		3	10
9		2	10		2	16		3	2		3	16		3	21
10		2	10		2	26		3	14		3	26	1	0	10
11		2	25		3	12		3	12	1	0	0	1	0	0
12		2	23		3	16		3	24	1	0	0	1	0	16
13		2	22		2	24		3	10		3	0		..[1]	
14		2	12		3	4		3	13		3	26	1	0	0
15		2	12		2	20		3	8		3	12		3	12
16		2	14		3	2		3	22	1	0	0	1	0	0
17		2	16		3	0		3	13		3	25	1	0	0
18		2	8		2	16		3	4		3	25	1	0	0
19		2	20		3	0		3	16	1	0	0	1	0	0
20		2	12		3	0		3	18	1	0	0	1	0	0
Average .		2	$12\frac{4}{5}$		2	25		3	$9\frac{1}{5}$		3	$18\frac{3}{5}$		3	$21\frac{2}{3}$

[1] No. 6 was not killed but disposed of among stores. No. 13 died.

DAIRYING AT HOME AND ABROAD—METHODS AND PROFITS COMPARED.

By JAMES LONG, Burleigh, Cheshunt.

IT has long been the practice to compare the British systems of dairying with those of certain foreign countries, to the disadvantage of those engaged in the work in this country. There has in the past been some real cause for this form of depreciation; but if, looking at the matter from an unbiassed point of view, we admit that we have been backward, both in the science and practice of dairy-work, and that, so far as science is concerned, we are still dependent for a large proportion of the information which we utilise upon foreign sources, we think it can yet be shown that in practice our work, whether it be in the manufacture of butter or of cheese, is in its advanced stage at least as good as any which is accomplished in any part of the world. Where we have failed in the past, and where we are still behindhand, is in what we may term the dairy of the rank and file, which has made such progress in Denmark, Sweden, and other countries of the Continent. It is but a truism to suggest that there is no butter produced in the world which is superior to the best which is manufactured in this country, and that as regards our cheese, really fine samples of Cheddar, Cheshire, Stilton, Wensleydale, and Leicester are uneclipsed if not unequalled by the products of any other country. The difficulty which still attaches to British dairy-work is not that our best makers need any assistance or advice, but that the thousands who fail to reach an approximately high standard are in large degree accountable for the unsatisfactory goods of our markets, and for the increasing power of the competition which exists, especially between our colonies and ourselves.

A few years ago the dairy was regarded as the most profitable branch of British agriculture. As a branch, whatever may be the case in individual instances, it can be so regarded no longer. The prosperity which, both in the press and on the platform, attached to dairy-farming, attracted large numbers of outsiders to the ranks, and induced equally large numbers of corn-farmers and graziers to add milking cows to their stock, with the first result that the increasing competition was followed by a reduction in prices—a reduction which, apart from temporary rises occasioned by drought, has been maintained until this day. To this competition we may add the still greater difficulty which has arisen in consequence of the scarcity of labour. In some

parts of the country it is now impossible to obtain trustworthy milkers at any price within the range of the farmer's means, and one by one some of the staunchest adherents of dairy-farming are entirely abandoning the business.

The intervention of education, late as it was, came at a convenient season. It at least saved a large proportion of the British trade; for in face of the fine butter which arrives from so many parts of the world, it would have been absolutely impossible for producers of an article so inferior that it frequently fell to 6d. a pound, to have maintained any trade at all. Since the establishment of the Dairy Institutes, which commenced some twelve years ago, not only have hundreds of teachers been trained, and in the majority of cases trained well, but many thousands of persons from almost every English county have received instruction in the manufacture of butter or cheese, with the result that modern practice, based upon advanced and sound principles, have penetrated more or less clearly into every dairy in the land.

At the recent London Dairy Show three of the champion cups were awarded to competitors who owe their skill entirely to education: in two of these cases the prize-takers had received the very best form of instruction which the country affords, with the result that they vanquished the most redoubtable manufacturers in Great Britain; while in the third case an exhibitor of many years' standing was able to accomplish an almost phenomenal feat which was owing to information, as we are directly informed, gained by watching the competitors at the various dairy exhibitions, and by the adoption of the very best practice which is the result of advanced education.

In comparing the work carried on in Great Britain at the present time with that conducted abroad, we are bound to remember that although no form of instruction could be obtained in this country a few years ago, there were numerous schools and courses of instruction open on the Continent of Europe. Nor do we forget that since our own programme of education was commenced we have carried on aggressive work on an infinitely larger and more costly scale than the people of any other country in the world. What, therefore, we lost by commencing late in life we have presumably gained by the energy which has been displayed, and by the extent of the field which has been covered.

The dairy schools of France, to which the writer has often referred, from personal knowledge of the work, are by comparison with our own of a distinctly inferior character. It is not uncommon to find the teachers of theory instructing the pupils in an absolutely opposite course to the teacher of practice, while it has happened that the lecturer has had no personal knowledge

of practice, and that the practitioner has possessed absolutely no knowledge of principles—indeed, on the contrary, has ridiculed the principles which have been taught in the same institution. Our experience of the teaching in the north of France, at all events, is that the pupils are neither taught principles nor practice as they should be taught, but that the work performed upon many of the dairy-farms is of the highest character, although very largely unaccompanied by a knowledge of principles; in a word, the maker has not been able to ascertain the reason why.

In Italy there are several dairy schools, some of which are excellently managed, where the pupils learn to perform the work of manufacture, and where they are enabled to see the process of production from the feeding of the cows to the sale of the cheese or butter.

In Switzerland, which is essentially a cheese-making country, the training of the cheese-maker is most thorough and complete, and in no country are greater pains taken to turn out a thoroughly competent and even accomplished man; but the country is small, and although producers are large, those who manufacture cheese are extremely few in number. The cheese of the country, Emmenthaler and Gruyère, are of very large size, requiring in their manufacture a huge quantity of milk, with the result that, as producers are both numerous and small, the cheese is made upon the factory system, under which the owner of a single cow realises as much per gallon of milk produced as the owner of fifty cows, although such large owners are extremely few.

In Holland, where farmers are very numerous, the farms are still of small size; but the size of the two national cheeses, the Edam and the Gouda, is such that an owner of a few cows is able to make his own cheese; and owing to this fact, as well as to the further fact that so many of the occupiers of land are also the owners, home dairying is the rule and co-operative cheese dairying the exception. Some instruction is provided in Holland, but as compared with Great Britain and the other countries referred to, it is comparatively small; indeed Dutch cheese-making occupies a position which has varied very slightly during the past twenty-five years. The same old-world plans, habits, customs, and utensils which were prominent twenty-five years ago are recognisable to-day, and we cannot include the Dutch farmer in the van of the dairy movement. It is nevertheless true that Holland conducts a very considerable trade in two materials, butter and margarine, both of which are the products of some considerable factories; but the energy with which this particular work is pursued is rather characteristic of the business man and manufacturer than of the agricultural

population. If we were to compare the possibilities of the labouring classes on the land in either of the European countries to which we are referring with those in Great Britain, we should find that the British farmer is so severely handicapped that we should regard, as the writer does regard, the maintenance of a semblance of prosperity as a matter of but a few years' duration.

The labour question has not touched the whole of Great Britain in its most difficult form, but in many parts of England it is causing greater distress and anxiety for the future than has been felt since the eventful year of 1879. We venture to say that neither the rent of the land nor the lower prices which are the result of foreign competition stand in the way of the maintenance of a decent profit to the dairy-farmer; but we do believe, and our belief is based upon a multitude of facts with which we are only too intimately acquainted, that large numbers of dairy-farmers are passing through a period of enormous difficulty, and that they can see no prospect of being able to maintain their position in the future.

Wherever successful dairying is referred to, the name of Denmark immediately occurs, and in this first general comparison we must not omit to remark that the success of the Danes, as of their neighbours the Swedes, is primarily owing to organised education. The writer has had the advantage of maintaining close relations with leaders of Danish agricultural education since the year 1883, when the first complete description of the work then in progress, subsequent to the report of the Assistant Commissioner, the late Mr H. M. Jenkins, was published. If we were to suggest that Denmark owes its position to the fact that it is the producer of the finest butter in the world, we should err; this is not the case. It is, however, in all probability the finest keeping butter which hails from any country. The Danish farmer, if we except a small number of large occupations, is a working farmer; in the vast majority of cases he is practically a peasant owning his own property. His requirements are small; his expenses are comparatively inconsiderable; he is satisfied with a moderate price for his milk; and he combines with his neighbours to run a factory and to export the produce of that factory to Great Britain. Add to this the fact that his work as an individual, or as a unit among a body of individuals, is based on sound education, and we have the secret of the success of Danish agriculture, which from first to last has been paternally aided at but a very moderate cost by a very practical Government.

Lastly, we refer to Canada, which we do not confound with foreign countries. In the Dominion the increase in the quality and quantity of dairy produce is astounding, and if the instruc-

tion afforded is not so extensive as is the case in so small a country as Denmark, it is yet considerable; but, happily for the Canadian farmer, the Government has supplemented its educational work with a form of assistance which has given a lead in the right direction. What a group of farmers fail to do of themselves they have accomplished by Government aid. Desirous to establish a factory, but possessing neither the knowledge nor the means, the Government has stepped in, provided the instructor, and advanced the money for building and plant, until the factory is able to run alone. Similarly, in the matter of export, the English market has been opened by the personal visits of experts, while the shipping companies have been induced to convey produce in special cool chambers at the cost of the taxpayer. In a word, the manufacture of dairy goods in Canada, their shipment and sale, are processes which have been absolutely established by the State; and once established, the farmers are very properly left to carry on the work with their own resources.

The facts which have been elicited are sufficient to show, in the first place, that the educational system in this country is worthy of the name, and that the money advanced for the purpose came not one whit too early; that this education has resulted, and is still resulting, most beneficially; that having been enabled with State assistance to acquire a knowledge of his business, the butter and cheese producer must rely upon his own resources and make his own markets. In the butter-market he has to contend against the world. There are few agricultural countries, viewing the word in its modern aspect, which do not export butter to our shores or which have not that intention. As regards cheese, he has to contend against Canada and the Australian colonies, all of which are making strenuous efforts not merely to increase the output, but to bring up the quality close to that of Wigtownshire or Somerset, for the class of cheese which we import is practically all Cheddar.

Of Continental nations we have little fear in the cheese-market. We import quantities, although not very serious quantities, of their more tasty varieties; but whether these varieties, which already possess a market, will ever be made in this country, depends not upon instruction, but upon the energy of dairy-farmers themselves. So far as past experience is concerned there are no signs in that direction. Edam and Gouda cheese is not worth producing; we can buy it cheaper from the Dutch. Gruyère and Gorgonzola can be produced here as well as in France, Switzerland, and Italy; but the realisable profits are not considerable, although they are sound. The French cheeses, such as Camembert, have long been produced in England on a small scale, and offer considerable profits; but our conserva-

tive agricultural population appear to have as little respect for French cheese as for Frenchmen, which is much to be regretted. It is within our immediate knowledge that very large profits are made by the French from the manufacture of at least half-a-dozen varieties of cheese of similar character, and that those who export to this country, which they do in a large way, are extremely prosperous individuals in consequence. The English market is responsible since the war of 1870 for considerable prosperity among the farmers of parts of Normandy, especially of the Bessin and the Pays d'Auge. Many of these individuals, driven to export by the conditions of the war with Germany, have continued to do so, with the result that they have been able to purchase the farms which they occupy, and of which they were formerly tenants. The line adopted by this class of French farmer is in close contradistinction to the life-habits of the English farmer across the Channel, less than a hundred miles away: he and his family are slaves to their work; they live upon a scale of excessive thrift; blue slops and sabots are their constant companions; their habits are frugal and their expenses few, and their object in life is apparently the maintenance of their stock in high condition, the exaction by abundant manuring of large quantities of produce, and the purchase, acre by acre, of the land either in their own occupation or in their immediate vicinity.

Let us proceed by examining the condition of affairs at the time of the introduction of the modern system into England. The writer was led to make a study of this particular subject a longer time ago than he cares to contemplate, by reason of the fact that difficulties arose in practice which could not be explained by the best authorities of the time. Recognising that a certain amount of good work was done abroad, to the Continent he went with sufficiently good results to induce a study of Continental methods, which it was quickly shown were superior to those adopted in this country, inasmuch as the latter were unorganised and consequently unsatisfactory. As a matter of fact certain difficulties—the cause of which the simplest student of to-day would be expected to explain—were apparently not understood by any one amongst us. The dairy had been relegated to the housewife or the cook; it was regarded as a subsidiary department, altogether unworthy of the attention of the farmer, except in a few of the leading cheese-making districts; and even there it was the custom of the farmer, with his hands in his pockets, to rate his wife, his daughter, or his dairymaid over the cheese-tub, rather than to offer her any assistance.

The younger generation of to-day, who have been engaged in the work for just a handful of years, have no conception of the chaos which existed a quarter of a century ago. Comparatively

speaking, modern dairying is now methodised, and the student is able to take up his handbook and learn every known detail in the study or in the dairy, as though our systems had been created rather than constructed. Before the days of the separator, the subject of discussion in relation to butter-making was chiefly with regard to the best method of raising cream; but to-day the Cooley and the Schwartz, like other gravitation systems, are practically dead, for the separator is king. We hear now little or nothing of the controversy between the advocates of sweet and sour cream for the production of butter; that question, too, is settled, and at last it is recognised that fine butter must be the product of sour or ripened cream, that it must be washed in the grain in the churn with the object of removing as far as possible every particle of matter present except the fat itself. This plan is practically followed throughout the British islands; but like the people of other countries, we have our tastes and our fancies with regard to the utilisation of salt. The educated palate prefers butter of the mildest character, either free from salt or very slightly salted. The working classes, who are compelled to make the most of every pound of butter which they purchase, naturally prefer a larger quantity of salt; for if the palate cannot be satisfied with quantity, it must be satisfied with flavour—and the remark equally applies to cheese. The mining and industrial classes of the north prefer the specially made and strong cheeses of Cheshire and Lancashire to the finer flavour of the Cheddar cheese and the long-keeping variety which is made in Cheshire.

When we turn to the Continent we find some divergence in the systems of butter manufacture which there prevail. In speaking of French butter the average Englishman has in his mind only the type of French butter which reaches this country, and most of which is extremely mild and lightly salted, but heavily preserved with chemical compounds. From the same districts of Northern France the finest butter which reaches the Paris market is produced, but that butter is not manufactured in accordance with the British system. French butter sent into the British market is chiefly the product of the blending-house; it is purchased in bulk in the open market, graded and blended, with the result that each grade is similar in colour and flavour throughout the entire year. But the fine butter which goes to Paris is made upon the farm and despatched direct from the farm, except in few instances. The finest brands are the product of sweet cream, which is raised in deep conical earthenware vessels, standing in a milk-room in a channel of water, oftentimes running water. The *fleurette* or first cream is churned for the production of the finest class of butter; and we have known instances in which such butter has realised for the

farmer from 2s. 1d. to 2s. 8d. per British pound. Here, then, is one divergence from the British system.

The average sample of Norman butter, whether for France or for England, is not made with the intervention of the separator. The cream is raised in similar vessels to those already named. The temperature of the milk-room is suddenly raised; the milk beneath the cream is coagulated; the cream is skimmed and the curdy mass is taken away to the calves, which are fattened upon it for the production of veal. The cream raised in this way is naturally ripened, but the acidity is not so advanced as is the case in England and some other countries.

Here a few words dealing succinctly with the Normandy system may be introduced. Until the year 1870 or thereabouts the quantity of butter shipped from Cherbourg to this country was a matter of a few hundred tons. Two years after the Franco-German war, which had stimulated the exports, 3000 tons was reached, and there was a yearly increase until in 1895 the total reached 18,000 tons, which affords some indication of the enormity of the industry in a practically small district. It is chiefly owing to the inducements which the French and English railway companies have afforded that the trade has reached these dimensions. A train arrives at Cherbourg each evening to catch a steamer, which arrives at Southampton on the following morning. The charges for carriage are small, being based upon a sliding scale in France which permits of the conveyance of butter for a distance of 150 kilometres (about 93 miles) at the rate of 1d. per ton per kilometre. The English railway company conveys the same butter from Cherbourg to London at 16s. 8d. a ton, so that the shipper, 93 miles from the port of Cherbourg, can land his butter in London in a good deal less than twenty-four hours at a cost of 24s. 5d. a ton, or about $\frac{1}{8}$d. a pound. Here, then, is one portion of a system which, as elsewhere, assists the foreign producer to overcome the British farmer. Almost all the French butter arriving in this way is despatched by the large blending-houses, over one of which—the largest of all, that of Messrs Bretel Frères—I was enabled to take a party at the time of the Jersey Conference. Since that time the doors have been closed against the inquisitive public. The machinery employed by Messrs Bretel Frères is capable of mixing from 50 to 60 tons of butter per day, large quantities of which are made into rolls and packed in boxes of two dozen pounds. The farmers who produce this butter are in large measure small occupiers, what we should call peasant farmers, owning useful cattle and doing practically all their own work. The cattle employed are known as the Cotentin, really a subvariety of the Normandy breed, producing milk of a similar quality to that of the British dairy shorthorn, 1 lb. of butter

being on the average the produce of $2\frac{1}{2}$ gallons of milk; but the cows do not average so large a yield as the best of our dairy shorthorns. The butter produced, as already indicated, is in most cases taken to market and sold *en bloc*, the average price of a good dairy being 1s. a pound, providing a profit to the blending-house of from 1d. to $1\frac{1}{2}$d. per pound. The smaller farmers referred to keep from six to ten cows, and being tenants in some cases, pay really considerable rents, especially in the richer districts, which, like that of Aisne, are favoured with exceptionally rich pasture. There are but few factories or creameries in Normandy for the production of butter. In one important case success has not been very definite, the price having fallen from year to year, this butter failing to oust the blended butter from the market.

The dairying districts of France, however, are not confined to Normandy: there are several other districts in which butter of much stronger flavour is produced for the great working-class populations of Paris, Lyons, Marseilles, and other great cities. The French *ouvrier*, like the Belgian and the German, is as fond of strength of flavour as the Lancashire operative; indeed he goes beyond the English workman, who draws the line at such products as Livarot and Limburger cheese.

The butter manufactured in Switzerland and Italy is chiefly produced upon the systems which are common in France; but when we turn to Germany, and to Denmark, and the other Scandinavian countries, we find that in the large bulk of the butter produced for export—and butter-making is the great industry of the Danish people—attention is directed to those points which have the most pronounced influence upon keeping qualities. In Great Britain there are comparatively few factories, and the factories which do exist make for a quickly consuming population which is practically at their doors. The factories of Denmark, considerably more than 1500 in number, are far in advance of our own in equipment. Pasteurisation and inoculation, although not unknown among us, are processes which it is possible have not yet been touched in half-a-dozen British factories. The object of the Danes is to destroy every living germ which is inimical to the keeping of butter, and subsequently to introduce, through the medium of inoculation, other germs which have been cultivated in a pure form, and which are essential to the development of the flavour of butter. This, then, is the essential difference between the advanced butter-makers of the East and ourselves. England has scarcely a place upon the market, and it is difficult to quote British butter for comparison with Danish. The reason is that the co-operative system of Denmark enables a small people to send large consignments, whereas the absence of similar co-operation in this

country is the cause of the absence of similar parcels of butter from the British market.

The butter industry in Denmark is now more than forty years old, but its more marked advance has been made during the past twenty years. On our first visit to Denmark in 1883 the exports amounted to between 200,000 and 300,000 cwt. per annum. The exports to England alone now exceed $1\frac{1}{4}$ million cwt. With the rise of the butter industry there was a decline in the production of corn, for while twenty years ago the net *export* of corn from Denmark was 200,000 quarters, the net *import* is now more than double that quantity. It will be observed that under the French system the farmer is paid for his butter, utilising his skimmed milk, which is by no means devoid of fat, for his calves. In Denmark the farmers deliver their milk to the creamery, where they obtain from $3\frac{1}{2}$d. to 4d., and occasionally a little more, per gallon, taking the skim-milk in return at a cost of $\frac{1}{2}$d. a gallon. Except in Copenhagen, where milk is purchased from farmers at $6\frac{1}{2}$d. per gallon, there is practically no milk-market, so that Denmark is a nation of butter-makers.

Replies have often been given to those who have twitted the British farmer upon his refusal to co-operate. So long, however, as he can sell his milk for consumption in the large centres of population at higher prices than he can obtain from the assistance of a creamery or butter-factory, so long will he continue to refuse to combine. We do not look for any such form of combination. With our increasing population an increasing supply of milk is demanded, and we have a profound belief that that increased supply will not long be forthcoming at existing prices. It will be forbidden by the working classes themselves, who are not only declining to accept existing wages, but to have anything to do with dairy cattle at all.

If we in Great Britain admit that we were later in the field than the people of the Continent, or of part of the Continent, we were at least ahead of the United States, although within the last ten years dairy schools have been opened in almost every State in the Union, where, prior to that period, no single school existed. There are many makers of fine mild butter in America, but the general idea of the quality of butter in the States is entirely opposed to the idea of the educated classes in this country. When in America we formed the opinion—it is to be hoped not unkindly—that the American citizen had no more knowledge of what perfect butter was like than the man in the street in our own country,—for the latter assuredly does not, and it is for this reason that he has for so many years been simple enough to take the bait which has been thrown to him by the retailers of margarine. In order to obtain a place upon the

British market, the American Minister of Agriculture sent qualified experts to this country with the object of learning precisely what consumers desired, with the result that consignments have since been made to order, and America is becoming a competitor with Northern Europe, with Canada, and our colonies in our butter-market.

We do not regard competition in butter as a very serious affair for the British people,—it is advantageous to the consumer; but Ireland is too close to our shores—assuming that a duty existed—to enable British farmers to produce butter with any great pecuniary success. But for the existing competition, Ireland might, and under its new system would, be highly prosperous. The existing butter trade in Ireland depends entirely upon its own people; in self-defence it has had to adopt the methods through the medium of which its opponents have achieved success. In Ireland it is organisation, to be followed, it is to be hoped, by education; in Denmark it is education followed by organisation.

In Sweden, as in parts of Norway, which is being gradually developed as a butter-making country, the system adopted is very similar to that of Denmark. The Swartz system, formerly so popular, is practically abandoned for the all-conquering separator. The native cows of Sweden yield an average annual production of 350 gallons of milk, although this average is gradually increased by the introduction of Ayrshire cows, many of which we have seen both in Sweden and in Norway. In all there are some 1200 factories or creameries at which milk obtained from different persons is employed in the manufacture of butter. There are, on numerous large estates, similar factories in which the milk produced upon the estate is alone handled. In those combined factories the quantity of butter produced exceeds half a million cwt., most of which is exported to Great Britain.

We have now dealt with those foreign countries—for our colonies are not included in this inquiry—which are chiefly regarded as competitors in the British butter-market. Holland is the only remaining foreign country which contributes any very material quantity of butter, for the imports from the United States showed an extraordinary falling off a year ago, while those from Germany are hardly worthy of consideration. Apart from Holland, the imports from France and the Scandinavian countries alone demand our serious attention; but the Dutch system, if worthy of some reference in consequence of the magnitude of the imports, in no sense comes into conflict with any system which should be adopted by farmers in this country. In 1884, at the time of the International Agricultural Exhibition at Amsterdam, we had an excellent opportunity

of investigating the system of dairy-farming in some of the chief provinces of Holland. The system obtains with very slight alterations up to the present day. We believe that the farmers in the great majority of cases still adhere to old-fashioned methods of obtaining the cream, the milk being still set in well-painted tubs, which are not always placed in cool or cleanly apartments. Dutch butter, in a word, is not a competitor among the high-class varieties which reach our shores. It is largely employed in the manufacture of margarine, for which it is especially prepared, and it is also largely consumed by the working classes, who esteem it perhaps as much for the strength of its flavour as for the lowness of its price.

A Comparison of Men.

In making a comparison between the butter-making systems and profits of the British producer with those of his most dangerous competitors, we have to consider the position of the farmer as tenant or owner of the land, his outlay from the point of view of labour, his cattle and his crops as productive material, and the quantity and quality of the milk produced. The British dairy-farmer is a tenant paying from 20s. to 30s. an acre for his land, and employing labour which costs from 50s. to 60s. per cow per annum, quite apart from the cost involved in the production and cartage of the food consumed by the stock. The Norman and Breton butter-making farmer, also in most cases a tenant, pays a somewhat higher rent, but he has no big labour bill to meet. The Danish and the Swedish farmers, like those of Canada and the United States, are owners of their farms, paying no rent, very moderate sums in the form of taxes, and, except upon the larger farms, which are very few in number, little if anything in the form of wages. In Holland, too, the smaller dairy-farmers are in large measure owners of their farms, employing no hired labour except when the crops are gathered in, and able in consequence to live with some comfort upon the small income derived from the sale of their butter and cheese: so far, then, the British dairy-farmer is handicapped. That he should pay so large a sum in wages in addition to his rent is not a little surprising to the farmers in the countries named; but although there are districts in Great Britain, and especially in Lancashire, in which the farmers do their own work—to some extent in consequence of the high rents they pay—and in consequence live laborious lives, custom, developed year after year by contact with a huge city population, entirely prevents that contentment which prevails in countries where farmers are isolated, and where the temptations are less numerous and pregnant. The working

owner of the soil in Denmark, Sweden, France, and Holland is regarded as a peasant or a boor, but he is in possession and is satisfied to work. The British farmer, on the contrary, although a tenant, is in large measure a man of greater refinement, occupying, in relation to his neighbours, a better social position, and expected to maintain that position in a manner which would be impossible in the other cases mentioned.

A Comparison of Cattle.

Let us next compare the cattle of each country as regards their butter-producing value, and some figures will in large measure help us in our estimate of the value of the cows which are chiefly employed in the production of British cheese. It will be convenient if the figures relating to the quantity of milk produced, its quality from the point of view of its fat percentage, with the estimated quantity of butter per cow, are tabulated. We include the Jerseys and Guernseys under the head of Channel Islands cattle:—

	Dairy Shorthorn	Channel Islands.	Ayrshires.
Yield per cow per annum, gallons	600	480	550
Fat percentage	3·8	5·3	3·8
Pounds of milk to 1 lb. of butter .	25	20	25
Pounds of butter per annum . .	240	240	220
Average value per pound . .	1s. to 1s. 4d.	1s. 2d. to 1s. 6d.	1s. to 1s. 3d.

The above figures, price excepted, are based upon recorded facts taken over a period of six years. The range of fat in the milk of the Shorthorn cows competing at the London Dairy Show has averaged from 3·82 to 4·14 per cent, so that the figure assigned to the Shorthorn is really below the average of six years' tests, although it is unmistakably above anything with which the Shorthorn is credited by the average reader. On the other hand, the Jerseys have ranged from 4·9 to 5·8, but we have credited the Channel Islands cattle with a lower figure, in consequence of the fact that the Guernseys have been allied with them. If we accepted these figures as representing the average Channel Islands cattle of the country, we should be compelled to credit the two breeds with a larger amount of butter than we have done; but there is every reason to believe that the cattle of these breeds exhibited in a public test are selected more or less systematically, whereas Shorthorn cattle are not. We place the Ayrshire milk, from its butter-producing value, on the same level as the milk of the Shorthorns; from the point of view of quantity, however, a reason steps in and warrants the figures. The number of Shorthorns exhibited has

been considerable, and the figures therefore have been accepted as more completely representative, whereas in the case of the Ayrshires the number of cattle tested has been extremely few. Nor is butter produced from Ayrshire milk quite so rich in quality as that produced from Shorthorn milk. It is probable, however, that in the case of the Shorthorn milk, the quality shown in our table is not absolutely representative of the herds of cattle which are kept for the production of milk for sale as distinct from the production of milk for butter-making. English Shorthorns have an inherent property which might be largely developed, for not only do they produce a large volume of milk, but the butter-maker is able to select cows which yield milk of very high quality for his purpose.

Let us next make a similar comparison between the breeds employed in other countries. We take representative cattle of the French, Danish, Swedish, and Dutch breeds :—

	Normandy.	Danish	Swedish	Dutch.
Yield per cow per annum, gallons .	550	450	400	600
Fat percentage	3·5	3·4	3 4	3 3
Pounds of milk to 1 lb. of butter .	26	28	28	29
Pounds of butter per annum . .	211	160	142	206
	lb	gall	gall.	gall
Prices realised	1s.[1]	3½d. to 4d.	4½d.	4½d.[2]

In dealing with the question of prices, we have to remember that butter-making is not an organised industry in Great Britain, and that, consequently, we cannot compare any particular figure as the average of the prices received by our farmers with the figures provided in the case of the four foreign countries named. The British farmer can realise a higher price per pound for fine butter than any foreign producer, except, perhaps, a few who send the pick of the Isigny butter to Paris. If Channel Islands cattle are employed, it is not difficult to obtain 25 to 40 per cent more than the French farmer, consequently we are in a position to realise higher prices on the farm—we do not refer to the factory—than are obtained by either French, Danish, Swedish, or Dutch makers.

As in the case of the Irish, who realise a similar sum to that obtained by the farmers in the three latter countries, the price enables him to pay his way in consequence of the fact that his outgoings are small compared with those of the British farmer, especially as regards rent and labour. Reduce our farmers to small occupying owners paying a nominal sum for labour, and they would be able to make both ends meet as well as other people. If we were to base our estimate of the comparative value

[1] Plus butter-milk. [2] Including value of butter milk.

of butter-making in Great Britain upon the actual conditions which even now prevail, we should be compelled to express our belief that when the prices realised vary from 7d. to 1s. rather than from 1s. to 1s. 6d., butter-making is not only an uneconomical, but a disastrous industry. We have seen that we possess the best cattle for the production of butter; we know that we have good soil, an excellent climate, and capable farmers. Why, then, is the butter-making industry so little esteemed? The answer is not difficult. It is owing to two causes: first, to the market price of milk sold for consumption; and next, to the fact that farmers as a body do not take pains to produce the finest possible article, and to obtain customers for themselves—the only plan of making butter-production pay.

CHEESE.

It is a very curious fact that the most famous varieties of cheese known to the world are the produce of four countries—Great Britain, France, Italy, and Switzerland—and that outside of these countries, with the exception of Holland, in which two varieties of cheese of very second-class character are produced, there is absolutely nothing which can be distinguished as worthy of special attention. The cheese produced in the United States and in Canada is essentially of British type. Why in countries so characteristic of dairy-farming as Ireland, Denmark, Sweden, and parts of the German empire, there should be no varieties of cheese possessing a special character of their own, it is somewhat difficult to understand, but the fact remains. In making a comparison between the systems adopted in Great Britain and in those countries to which we have referred, we are bound to note that numerous as are the varieties of cheese, and differing as they do in character, size, flavour, and consistence, they are all made in accordance with principles which are now well understood, and which, in the case of the most skilled manufactures, are recognised in every part of the process. The following may be recognised as those which have a right to be regarded as first-class varieties, as well as types of cheese of a particular character:—

Hard or Pressed Cheese.

British.	*French.*	*Italian.*	*Dutch.*
Cheddar.	Gruyère.	Parmesan.	Edam.
Cheshire.	Cantal.		Gouda.
Leicester.			
Gloucester.			

Blue or Veined Cheese.

British.	*French.*	*Italian.*
Stilton.	Roquefort.	Gorgonzola.
Wensleydale.	Gex.	
Cotherstone.		

Soft Cheese.

French.

Brie.	Mont d'Or.	Pont l'Êveque.
Camembert.	Neufchâtel.	Coulommiers.

As regards the last-named, all of which are ripened cheeses and of very high quality, we may take it that out of France, which is the home of cheese of this character, there is really nothing worthy of the name produced in any country in the world. Even in our own country, where soft cheese is made, although chiefly during the summer season, the one or two local varieties which in some sense approximate to the Brie are much inferior. They are produced upon no recognised system, but by rule of thumb alone; they have no market in the strict sense of the term; and for every good sample it is probable that half-a-dozen bad samples are produced. In France there are at least twenty other varieties of soft cheese which may be regarded as more or less distinct. There are also two or three varieties of slightly pressed cheeses, such as the Port du Salut, which has its counterpart, although an inferior one, in the Caerphilly of South Wales. We shall endeavour to compare the systems under which typical varieties of some of these classes of cheese are produced, as well as the profits which are realised, or which it is possible to realise, in their production.

Let us first refer to a few facts which bear upon the general question, and which influence the cheese-making industry in a degree not entirely appreciated by the dairy-farming community. At the present time rich milking cattle are reserved for the production of butter, and it is part of the creed of many cheese-makers that cows producing unusually rich milk, such as the Jersey or Guernsey, are not adapted for the manufacture of cheese, upon the erroneous assumption that cheese of high quality cannot be obtained from milk of high quality—milk which, in a word, is rich in fat. We never remember to have seen a Jersey cow in a cheese-maker's herd. This cannot be altogether on account of the almost valueless nature of the bull calves, or of the fact that when the cow is no longer of use in the dairy she cannot be converted into beef. Not only is the quality of cheese of some varieties—and we speak of those alone of which we have practical experience—improved when the milk is rich, but the yield is very largely increased.

If we may take the results of the great American tests at Chicago, we are bound to believe that the quality of the Cheddar cheese produced from rich milk was superior to that produced from normal milk, and that the return, owing to the increased quantity of cheese obtained, was out of all proportion to the relative value of the cheese per lb. Having been present at the time the trials were conducted, and having had numerous opportunities of seeing the cows and some of the processes adopted in the conduct of the work, we are the more enabled to appreciate the results which were achieved. Each pound of fat present in the milk increased the yield of cheese by 2·7 lb.; in other words, with an increase of fat in milk employed in the manufacture of Cheddar cheese, there is an increase in the weight from other sources, these being casein and water. Let us make a comparison of the results achieved by the twenty-five Jersey cows employed in the tests as against the twenty-five Shorthorn cows, both lots having been specially selected. In the cheese-making tests the Jerseys produced 1451 lb. of cheese, valued at £40, 8s., whereas the Shorthorns produced only 1077 lb., valued at £29. It will be only just to admit that the Jerseys as Jerseys were of higher milking value than were the Shorthorns as Shorthorns; but the major portion of the increase was due not to the superiority of the Jerseys as milkers, but to the greater richness of their milk. Dairy-farmers who employ dairy Shorthorns are too much inclined to regard the quality of the milk produced by their cows as fixed within narrow limits, whereas the simplest examination of the figures relating to any important competition, such as those annually held at the London Dairy Show, will convince the most sceptical that Shorthorns which are rich milkers are much more general than is supposed, and that they can be produced by selection without difficulty. In our judgment the yield of cheese, whatever its character, might be increased by at least one-fifth upon almost any farm where at the present moment no regard is paid to the quality of the milk of the herd.

The quality of milk depends upon breed, or, shall we say, upon blood, for no system of feeding will enable a farmer to increase the average quality of the milk of any cow in his possession. A cow which under normal conditions produces milk containing 3·5 per cent of fat, cannot be induced to yield milk containing 4 per cent of fat by any addition to, or change in, her ration. Between calving in March and the end of the cheese-making season in October, her milk will fluctuate in quality, and as the flow diminishes the quality will increase; but assuming that she gets all the food that she requires, the quality cannot be varied by any system of feeding whatever. The assumption that the quality of milk can be improved by feed-

ing is erroneous; there have no doubt been many instances in which figures and facts apparently prove to the contrary; but where a cow is underfed or abnormally fed, she may produce milk of inferior quality, just as she may fall off in her yield. Because however a change from an incomplete ration to a complete ration is followed by an increase in the quantity of fat in the milk, it should not be assumed that the improved quality is owing to the influence of food. A cow normally fed produces milk of a quality which varies within narrow limits, and the maximum cannot be exceeded by the influence of anything which she consumes. On the other hand, judicious crossing will be followed by the production of richer milkers, and this fact has been demonstrated over and over again. We have referred to this point in the belief that the increase in the profits of cheese-making depends largely upon the increase in the quality of milk. The successful maker, who naturally obtains good prices, has little to hope for in that particular direction, but if he makes similar efforts to obtain more of the raw material—curd—from his cows by selection and crossing, he has always before him a goal which, if he cannot reach, he may at least approach.

Now we come to a comparison of the various points in which differences exist, as between the British and the Continental systems of cheese-making. The varieties of British pressed cheese differ very little in character. The principle upon which each is manufactured is the same. There is simply a difference in detail, and the same remark applies to British blue or veined cheese. The temperatures at which our British pressed cheese is renneted are within narrow limits, practically between 78° and 90° F. The leading cheeses of the Continent are produced from milk which is coagulated under temperatures of still wider range, 77° and 95° F. Again, the time occupied in coagulation varies with us from forty to ninety minutes, while the process of scalding, which is adopted in the case of so many varieties, is in this country practically limited to a temperature of 106° F., whereas on the Continent 125° F., and sometimes even 135° F., is reached; in a word, we may regard cooking, as it is termed, as part of the Continental process, but one which is never undertaken in this country. The British maker, whether he be a producer of Stilton, Cheddar, or Cheshire, salts the curd before it is vatted, using fine dry salt of high quality. The Continental maker, on the contrary, while using coarse salt, makes a practice of conveying this salt to the cheese from the outside; and this applies to the four countries which have been named, to the soft cheese as well as to the pressed cheese. And what is the result? The flavour of the portion of the cheese next to the actual rind is most objectionable, and there is in conse-

quence considerable waste. If the edible character of a Cheddar is not quite so agreeable as the cheese approaches the rind, in consequence of its tougher character, the flavour is not destroyed; but in several of the chief Continental varieties the flavour varies materially as between the outside and the inside, and this is chiefly, if not entirely, owing to the method of salting. Again, there is a difference in the method of ripening, although in one of our British varieties—the Cheshire—both quick- and slow-ripening cheeses are made. A slowly ripened cheese keeps long; a quickly ripened cheese tastes strong, and rapidly deteriorates. As an example of the difference in the time occupied in the ripening process, we may refer to the Parmesan, a very large hard-pressed cheese made in Italy, which is kept as long as three years before it becomes perfect. A remark may be incidentally made upon the method adopted in the ripening of this as of some other cheeses. In this country it is very seldom that a cheese manufacturer possesses any specially equipped ripening apartment, although such apartments are now provided at the two or three chief dairy schools; but the Italian cheese-maker with his ripening cellars—for they are underground—has long been in the habit of constructing these apartments upon a scientific principle, not merely for the retention of warmth but for the maintenance of moisture and draught.

The difference between the majority of the cheeses of France and those of Great Britain lies in the fact that no pressure is applied to the curd, or if applied, it is very slight; whereas, excepting as regards the blue-veined cheeses, the pressure applied to cheese with us is considerable. Pressure is naturally followed by expulsion of the whey, and therefore of the sugar, which is its chief ingredient. The larger the quantity of whey in a cheese the softer is its flesh and the more varied its flavour, within recognised limits. The larger the quantity of whey present too, the larger the profit; for a refined cheese like the Brie, which practically contains 50 per cent of moisture and 25 per cent of fat, realises a larger sum per lb. than the pressed cheese of our country, which contains only 34 per cent of water and 30 per cent of fat. A Brie weighing 3 lb. is produced from about 18 lb. of milk, or roughly, 1¾ gallon. Nevertheless, it realises at the rate of from 9d. to 1s. per lb.; so that if the English cheese is more substantial—although it does not follow that it is more valuable as a food, because to most consumers hard cheese is more or less indigestible—it is far less profitable, and it is perfectly immaterial to the consumer how large the quantity of water present is so long as his palate and appetite are satisfied. At the value to an English cheese-maker who produces his own milk, 1¾ gallon is worth from 10½d. to 11d.,

or ½d. more if we include the value of the whey. If the Frenchman, the manufacturer of Brie, can realise, as he does, more than double this amount, it follows that his profit must be substantial. In one part of France known to the writer there are five districts in which 6,000,000 Brie cheeses were annually made several years ago, while the number produced at the present time is probably 25 per cent greater.

In Great Britain cheese is not only made but ripened on the farm; in France and Italy it is a common practice for dealers to buy newly-made cheese and to ripen it themselves. The small manufacturers sacrifice an ulterior profit for the immediate advantage which cash confers. The cheese-factory system is not successful in England, but it is the basis of manufacture in parts of France, in Switzerland, Italy, America, and the colonies. In Great Britain the milk employed in the manufacture of cheese is produced by the manufacturer himself; in Italy, in Switzerland, and throughout a large part of France, cheese, especially the larger varieties—Gruyère, Emmenthaler, and Parmesan — is made from milk which is produced by numerous small cow-keepers, who daily convey it to the factory or to a large farmer for mixture with his own milk.

Again, in England, our large cheeses, almost without exception, are made from a mixture of the two milks of the day, that of the night and of the following morning. On the contrary, the pressed whole-milk cheeses of the Continent are almost in every case the product of the milk of a single meal. The curd used in the production of British hard cheese is ground before it is placed in the vat. We do not know of a single instance in which an important Continental variety is ground at all, the manipulation being confined to the cheese tub or kettle. While the curd is broken down by the aid of implements somewhat resembling the American curd-breaker, which is largely used in Cheshire for stirring, in our own country it is cut with knives of many blades, those in one case being horizontal and in the other vertical. The result is that while the whey produced in the manufacture of the foreign cheese contains a large quantity of waste fat, that obtained where American knives are employed contains a minimum quantity.

If we were to compare the utensils employed in cheese-making by the Cheddar or Cheshire maker with those employed by the makers of France and other cheese-making countries of the Continent, we should find that great superiority rested with our own people, although this is largely owing to the introduction of American ideas. The somewhat antiquated but beautifully made copper cheese-kettles employed by the Swiss in the manufacture of Gruyère, and the inverted bell-like metal vat used by the Parmesan maker of Italy, are both fine specimens of work-

manship of their kind, but, compared with the modern Cheddar vat, they are half a century behind the times; and what applies to the plant applies, so far as the French, the Dutch, and the Italians are concerned, to the people, the large majority of whom are wanting in cleanliness, unskilful, and members of a class which, if honest and industrious, occupy a low position even in the agricultural social scale.

In Scotland, as in England, the cheese-making apartments are models of cleanliness and smartness. We have had the advantage of seeing large numbers of cheese dairies and factories in almost every cheese-making country, but in no case can we put a finger on one which approximately approaches the dairies of Ayrshire, Wigtownshire, and Cheshire. The British cheese-making class is composed of people of a superior caste altogether to those who are engaged in similar work on the Continent.

The want of quality in foreign cheese, as in Edam and Gorgonzola, is made up, from the point of view of the maker, by the employment of colour upon the outside skin or coat. The flesh of our English pressed cheese is close and firm, nutlike in flavour, and with a texture like salve; that of the Gruyère, the Parmesan, or the Dutch, to mention only three leading varieties, is of quite a different character, being studded with holes throughout. It is known that the addition of an acid to curd has a damaging influence from the point of view of quality; nevertheless, it is common among the Swiss and the Italians to mix vinegar with the rennet. Even the rennet itself, as used in Central Europe, differs from that employed in England, where a liquid extract of considerable strength and purity is employed, as opposed to the use of the macerated stomach of the calf which we have seen used on the Continent, dipped into the milk and actually squeezed by the hand, which was as filthy as the material itself.

We have already referred to the extremes of temperature which are employed in setting milk for curd. Just as Continental makers reach a very much higher temperature in the cooking process than the British maker, so do they employ in the manufacture of their soft cheese a very much lower temperature. The creamy consistence of a soft cheese depends upon the character of the curd. If formed quickly by the aid of heat or of a large quantity of rennet, it parts with its whey with great rapidity, with the result that the cheese is tough; if it is formed very slowly at a low temperature and by the aid of a small quantity of rennet, it parts with the whey very slowly, with the result that a larger quantity is retained and the cheese is creamy and tender. In the manufacture of British cheese where these facts are known they should be observed; for our cheese, if comparatively creamy on the palate, owes its condition only in part to the presence of moisture. Our practice of

cutting the curd into small cubes has much influence upon the character of the cheese. The larger the cube the more whey it holds, with the result that longer time and more labour are necessary in its expulsion. When the curd is cut into cubes, the whey, which is immediately next to its face, is expelled; but the surfaces of the cube are slightly contracted and toughened, with the result that the whey in the interior is prevented from escaping with anything like equal rapidity—and it is probably for this reason that each piece of curd which was formerly a cube remains so long mellow and tender, and that it carries with it into the cheese-vat a large proportion of whey. This result, which in a minor degree relates also to the curd employed in making the hard cheeses of the Continent, is an incident in the superior practice which is observed in this country.

British Cheese.

We may now briefly refer to three of our island varieties—Cheddar, Cheshire, and Stilton. Cheddar cheese, which has been described as the cheese of the world on account of its popularity and of the fact that it is the one important article of dairy produce made in Canada, the United States, and Australasia, as in England and Scotland, is the produce of the morning's milk added to the milk of the previous evening which has been maintained under given conditions throughout the night, the object being to prevent too large a development of acidity, and yet to provide acidity enough for the work to be performed. The flavour of Cheddar is very closely followed by fine samples of Gruyère, and Gouda—the flat cheese of Holland; and this fact was noted very definitely by the late Mr H. M. Jenkins and myself, when, at the time of the International Exhibition in Amsterdam, we paid numerous visits to the large cheese-factors of that city and made some purchases.

Many facts have been forthcoming with regard to Somerset practices through the medium of the investigations which have been made on behalf of the Bath and West of England Society by Mr Lloyd. On the basis of the work on seven Somerset farms, the average yield of the cows is shown to be 520 gallons per annum, with a range of fat of from 3 to 4·75 per cent. On the average of eight years the quantity of milk employed in the manufacture of a pound of cheese had been 1·01 gallon, varying from ·92 gallon in the month of April and increasing to 1·15 gallon in the month of October.

While Somerset is regarded as the county which produces the finest cheese in England of its kind, we cannot say that much satisfaction is to be derived from the figures relating to the milk

yield. We believe it to be incomparably smaller than the yield obtained in Cheshire, and it is certainly much smaller than the yield produced by almost any large dairy-farmer who sends milk away for consumption. We have known instances in Cheshire in which the receipts per cow, over a large number, have varied from £20 to £22 per annum. If every gallon of milk of 522 gallons were made into cheese, which of course it is not, and sold at 7d. a pound, it would be difficult to reach a total of £17, even though the calf and the whey were included. In making Cheddar cheese—and the remark applies equally to the other English hard-pressed varieties—the albumen and almost all the sugar are excluded, so that no more than one-half the solid matter in the milk is utilised, the other half remaining in the whey and being consumed by pigs. If we accept the figures already quoted, and assume that a good maker realises 65s. per 112 lb., we find that—estimating the value of the calf and the whey, and ignoring, as we are bound to do in such a calculation, for no other data is forthcoming, the fact that a certain proportion of the milk is sold—the Cheddar cheese-maker realises about 7d. per gallon for his milk. So far as Somerset is concerned, the gross return should be increased by the more careful selection of heavy milking cows producing milk of higher quality.

We are bound to conclude that the practice adopted in the south-west of Scotland, as in parts of the south of England by many makers, is more advantageous than the Somerset practice exemplified by our figures, where a substantial rent is paid by the dairyman or bower, who relieves the owner of the herd of a great deal of responsibility in connection with the management of the cattle and making of the cheese. This is not the place to discuss the systems of manufacture, for there are two or three in force, although the principles behind them are the same. We pass on to

Cheshire Cheese.

This cheese is also the produce of the mixed milk of the evening and the morning. It may be observed at once that Cheshire makers produce three varieties of cheese—early ripening, medium ripening, and late ripening. Omitting any detailed reference to the medium form of cheese, it may be remarked that in the early ripening variety the milk of the evening must have a minimum temperature of 63° F. in the morning, and an average temperature of 78° F. when the rennet is added, while the curd and whey are not heated up in the process of making. This cheese is from four to five weeks maturing. In making the late-ripening cheese, the morning temperature has a minimum

of 65° F.; the temperature of renneting is 90° F., while the maximum heating temperature is from 94° to 95° F.

The early-ripening cheese comes into the market in a very moist condition, and on account of its fuller or stronger flavour it is favoured by the artisan class of Lancashire and the north. The chief cause of the early ripening is the earlier development of acidity and the larger quantity of acid formed. This is brought about by several simple processes,—the addition of sour whey to the milk before renneting, cutting the curd coarse, and leaving the whey in the vat until a sufficient quantity of acid has been produced. The presence of more whey in the curd has a marked influence, and this curd is not pressed so severely as to remove it. The curd is not milled or ground before vatting.

It is worthy of remark that in making Cheshire cheese the temperature adopted for renneting increases as the months advance. Although we have quoted 90° F., 87° F. is adopted in April, gradually increasing to 92° F. in September, and in the colder month of November the maker reverts to 90° F. Similarly the curd is scalded at increasing temperatures, varying from 90° F. in April to 94° F. in October. One detail in the Cheshire process is the employment of the cheese-oven, into which the cheese goes when it is in the hoop.

Briefly, the processes are in the following order: The milk of the evening is placed in the cheese-vat, usually of rectangular form, and the temperature is regulated so that it does not fall below the minimum nor rise materially. After testing for acidity and adding the morning's milk, a process requiring considerable care, heating follows; next the addition of the rennet, the cutting of the curd, heating again, stirring, settling, drawing off the whey, cutting in blocks, piling; again cutting, turning, grinding, salting, and vatting. Then follows the cheese-oven, and lastly, the press. Although the best Cheshire makers possibly do not realise a larger sum per gallon for their milk than the best Cheddar makers, yet we have little doubt that the maker of early-ripening cheese, as well as the maker of the rank and file, realise slightly higher prices than those engaged in the Cheddar industry. Apart from this, the cattle of Cheshire and its vicinity are of a superior class to those of Somerset, inasmuch as they yield a larger quantity of milk and consequently of cheese.

In comparing Cheshire with Cheddar results, we are bound to express our belief that Scottish makers, by the aid of the Ayrshire cows and the system of feeding practised, produce more cheese per 1000 lb. of cow flesh as well as per gallon of milk than the Somerset makers, and in consequence achieve greater success in the department of the dairy.

Stilton Cheese

Stilton is produced from new milk, to which no cream is added. It may be made from the curd of a single meal or from the mixed curds of two meals. The process is conducted by a few makers upon scientific principles, but by the vast majority by rule of thumb, with the result that while 10d. to 1s. a pound is realised in one case, from 6d. to 8d. a pound is realised in others. Good Stilton will continue to realise a high price at Christmas so long as the multitude of makers are entirely ignorant of the principles upon which the system is based. Simple as the process is, a knowledge of the principles upon which every detail is developed is essential, for without this there can be no control, and control is peremptory if loss would be avoided.

Success depends upon purity of the milk, the cleanliness of the dairy and the utensils, the control of temperature, and a knowledge of the moment to vat the curd, as well as of every detail of the work. From the time of setting the milk to the sale of the cheese Stilton demands daily attention. The method by which the whey is expelled resembles that adopted by the maker of Gorgonzola cheese: but, unlike the Gorgonzola process, the curd is salted instead of the crust. The curd is not ground as in Cheddar making, but broken by hand, and from the date when the hoop is removed until the coat is formed, the cheese must be daily bandaged. In making Gorgonzola, and this is a type of the many Continental veined cheeses, two curds, one hot and the other cold, are blended. In making Stilton, if two curds are employed, both are cold, but of different ages. Stilton forms a coat of its own, although it is constantly attacked by mites; the Gorgonzola process prevents the formation of a natural coat, and this is owing to the constant salting of the crust and the subsequent colouring.

In the Stilton dairy there are two instruments which are essential to success—the thermometer and the hygrometer. As the salvy flesh of the cheese depends as much upon moisture as the weight, the air neither in the coating nor the ripening room must be too dry. We may take it that throughout the summer it takes from 1 gallon to 1⅕ gallon of milk to produce a pound of Stilton cheese. This large quantity is chiefly owing to the large area of crust in proportion to the weight of the cheese, and to the decomposition of the interior. A good maker should realise 10½d. a pound for all he makes, although it is probable that very few do this. The small skilled maker may succeed in doing still better, but with success a larger number of cheeses are made, paid hands become necessary, and then the work deteriorates. We may in any case regard the Stilton

process as the most profitable branch of British dairy-farming, although its profits are not equal to those obtained by the farmer of France who makes Brie, Camembert, and a few other choice varieties.

What applies to the Stilton cheese from the point of view of profit applies equally to the Wensleydale, but in both cases there are numbers of makers whose work is inferior, and who, as it were, with victory in their hands, are unable to escape annual defeat.

FOREIGN CHEESE.

We select three representative types of foreign cheese for comparison with those selected to represent Great Britain. The first is *Gruyère*, which forms the leading industry of Switzerland and of a large part of France. Produced from the mixed milk of many small cow-keepers at each meal, the milk is heated to 95° F., and broken in half an hour. Acidity is created by the aid of sour whey with which the rennet is mixed. After settling, the curd is cooked to 125° F., and sometimes as high as 135° F., with the object of expelling the whey. This is followed by stirring and the reduction of the curd. The eyes or holes in Gruyère are subsequently formed by the liberation of gas produced by the aid of a ferment peculiar to cheese. Unlike the English process, the curd is taken directly from the whey, the cloth being passed beneath it, lifted from the kettle by a crane and guided right into the hoop in which it goes to press, receiving a pressure of eighteen times its own weight. Salting follows from day to day. After salting, fermentation is permitted in a temperature of 60° F., the cheeses being subsequently changed into rooms with lower temperatures. One gallon of rich milk produces 1 lb. of cheese, but from average milk slightly more than 15 ounces are produced, the return to the milk-contributors being about 4d.

Swiss cheese is chiefly made in the factory, which is often very small and primitive; but in the canton of Berne alone there are nearly 700 factories. The butter produced from the whey amounts to from three-quarters of a pound to a pound per 100 lb. of milk. The best dairy cattle of the country yield nearly 3000 litres, or 650 gallons per annum, while the annual value of the milk produced is £7,000,000, the quality of the milk being estimated as containing 3·7 per cent of fat.

Gorgonzola.

Gorgonzola cheese is largely made by moving herdsmen as well as by farmers in Lombardy, many of whom sell the green cheese when it is firm enough to move to factors who ripen it,

and the consequence of this very costly system is that very much inferior cheese is produced,—a really fine sample being almost equal to a fine sample of Wensleydale or Stilton. The price realised for the raw curd, for it is scarcely cheese, is barely half that which is realised by the maker of blue-veined cheese in this country; and when we remember that average Gorgonzola is obtainable at very low prices per pound of the retail shopkeeper, we can fully understand that this is the case.

Gorgonzola is made from two curds, the milk being usually renneted at 90° F., and cut crudely in fifteen minutes. A common method of draining the warm curd is to hang it in a cloth—a plan which Stilton makers have found it advantageous to adopt on occasion. The morning curd, having been well drained and become firm and cold, is mixed with the warm evening curd, which is rapidly drained by the method already named. The mixture, almost immediately fit for the mould, is piled into it in a less workmanlike manner than that applied to Stilton, with the result that the crust is never so sightly and that there is more waste. The after-processes consist of salting, brining, ripening —control of temperature being important—and we may as well add, colouring. Although Gorgonzola may be a perfect cheese—for we once tasted a sample on Lake Maggiore which may be thus described—it is usually faulty, and we cannot describe it better than by the remark that it is a carelessly-made Wensleydale, salted and brined from the outside rather than from within.

Camembert.

Camembert cheese is produced at the rate of 2¼ cheeses to the gallon of rich milk, or, assuming the cheese to weigh 11 ounces, we have 24¾ ounces per 10 lb. of milk. As a cheese realises 5d. in the wholesale market, a gallon of milk consequently realises 11¼d.; but fine brands sometimes realise 6d. per cheese when sold by the dozen. As milk is purchasable in some of the French districts at 4d. a gallon, and as it is partially skimmed for the manufacture of butter, we can quite understand that many French makers realise a profit of 3d. per cheese, as they are known to do. The Camembert of to-day, produced from milk of which 25 per cent of the cream has been skimmed, is not like the Camembert which was made by the Paynel and other families, whom we visited nearly twenty years ago. At that time Mr Cyrille Paynel obtained 550 gallons of milk per head from 57 cows, and realised a gross return of £32 per cow, producing butter and Livarot cheese out of the Camembert season, in addition to the value of the butter-milk, the whey, and the calves. The Camembert, like Brie and Coulommiers, is a simple process, but demands knowledge which alone enables

the maker to grapple with difficulties as they arise. The curd is removed in slices into small moulds from which the whey drains, but only when the correct temperature is observed. Success depends upon temperature for drainage, for the growth of the mould on the outside of the cheese, and for the ripening of the curd within. Without the mould there can be no cheese. In the presence of acid the bacteria which convert the insoluble into the largely soluble curd are unable to act. The acid is removed by the growing moulds—the white champignons being followed by the blue penicillium—neither of which are able to grow, however, unless the cheese has been salted on the outside. The Camembert process necessitates conditions which really involve the cultivation of two varieties of fungus as well as a process of escape of a proportion of the whey and of the subsequent activity of the bacteria.

Conclusion.

Briefly summarising the comparative results obtained by the foreign and the British dairy-farmer, we are enabled to arrive at the conclusion, upon the basis of actual facts and figures derived on the spot, that the maker of foreign pressed or blue-veined cheese—we are especially referring to the farmer or the factory manager representing him—realises a much smaller price for his milk than the farmers in England and Scotland, and that his produce is generally inferior to our own. With regard to the fancy soft cheeses of France, however, the results are altogether different. The prices realised by makers of Brie, Camembert, Pont l'Êveque, Port du Salut, and some less popular varieties, are as high as, and in some cases higher than, those realised by the mere handful of makers of Stilton who obtain the top price of the market. Soft cheese-making offers ample opportunities for the realisation of similar profits in Great Britain, and it is to be lamented that the attempt is not made. There are, it is true, some half-dozen British makers of English cream or soft curd cheese on a somewhat large scale who are succeeding admirably; but when we know that there is a market in London and in other large cities for French varieties of the few popular kinds, we can only express surprise that no attempt has been made to supply it with English-made cheese.

As regards the manufacture of butter, while we are bound to claim that the best produce of Great Britain is not excelled by that of any other country, it cannot be produced on the gigantic scale necessary for the feeding of our people in face of the prices which Continental and colonial makers are willing to accept. The reasons for this have been sufficiently explained; and we need only add in conclusion that if, under existing con-

ditions, we are not likely to extend the butter industry, there is every reason why we should make great efforts to improve the general quality of our cheese, and to produce still larger quantities than we do at the present time, by the introduction of those methods which have been referred to in this paper.

IMPROVEMENT OF PASTURE AS DETERMINED BY THE EFFECTS ON THE STOCK.

By Professor SOMERVILLE, University of Cambridge.

ONE need not dip far into the agricultural literature of the day, nor have an extensive acquaintance with farmers, to know that much interest attaches to the relationship of quantity to quality of farm-crop produce. When the results of any particular form of manurial treatment are apparent in a large increase of crop, the question that, in effect, many farmers ask is, "Will a ton of this large crop, when consumed by farm animals, be able to produce as much beef, mutton, milk, or work as a ton of a smaller crop grown under less forcing circumstances?" Often as the question has been asked, and strong as is popular opinion on the subject, no very definite experimental results bearing on the subject are, so far as I am aware, available for reference.

In discussing the subject one must always very carefully bear in mind a distinction that is too much neglected. It must necessarily make a material difference—perhaps *all* the difference—whether one has in one's mind a simple crop like swedes or oats, or a complex crop like hay or pasture. In the case of such a crop as swedes, a manure—or some other cultural, geological, or climatic condition — can affect the quality only through a modification of the plant-substance; that is to say, the final product is still swedes, though these may vary in their nutritive properties.

It is claimed by many that if one portion of a field is treated with bone-meal and another portion with nitrate of soda and superphosphate, the "boned" roots will—weight for weight—produce a much higher rate of increase in the animals that consume them than will be the case with the other portion of the crop. Possibly this is so, but it may be due simply to the fact that the roots supplied with bones will not usually be so large as those grown with more easily available nitrogen and phosphoric acid; and it is a firmly established fact that

moderate-sized roots—whether turnips, mangels, or sugar beets —contain relatively more nutritive materials than excessively large roots. In bringing this matter to the test of experiment, the question of the influence of size should receive due attention.

While some farmers are strongly in favour of bone-meal, others believe that the quality of farm-crop produce is higher under the influence of farmyard manure than under any other circumstances; and as this manure will usually produce a heavier crop than any mixture of artificial fertilisers, the argument based on "size" does not come in. A farmer has been heard to say that if he applied farmyard manure and artificials to alternate drills of swedes, he found that when the crop was consumed on the ground by sheep the animals would attack the dunged drills first, and would only reluctantly consume the roots getting artificials alone. This would indicate a higher percentage of sugar in the former roots than in the latter. It is certainly an interesting point, if it can receive authentic confirmation; but I may say that, although I have given sheep such an opportunity of selecting their roots, they showed no preference for one lot more than for another.

Of one thing there would appear to be no doubt, and that is, that 100 tons of turnips grown in the best districts of the Lothians, or of the north-east of Scotland, can produce more meat than the same weight grown in a poor district—say between Midcalder and Carstairs. It is an accepted belief that the former class of roots, supplemented by straw, have as much effect on bullocks as the other class of roots, when supported by a liberal allowance of cake. To what is this difference in feeding value due? Is it a question of soil, or climate, or variety of root, or manurial treatment, or even class of animal? And if climate plays a part, is its influence confined to modifying the food, or does it also affect the animals consuming the food? The problem is by no means easy of solution, and might repay a larger amount of scientific attention than it has received.

When we turn to the class of mixed or complex crops the problem is at once simpler and more difficult. It is simpler, in so far that farming opinion is agreed that manures can profoundly modify the feeding value of the produce; it is more difficult, because we have here to deal not with one plant species, but with many. If the quality of the produce of a mixture of plants varies with the manurial treatment, it becomes interesting to inquire whether this variation is due to the effect of the manure on the plants *as plants*, or is caused by the stimulus imparted to the growth of some species at the expense of others.

At one time one is disposed to think that in a case of this

kind the manures influence the quality only because they encourage the growth of certain plants, and, directly or indirectly, repress the development of others; but another set of facts may be presented that make uncompromising adhesion to such a view impossible. A comparatively simple mixture of plants in a crop is presented by seeds-hay of the first year. Frequently such a crop consists only of ryegrass and clover, and according as it is dressed with a nitrogenous or with a phosphatic-potassic manure, so will ryegrass or clover—in the absence of disturbing causes—be relatively abundant.

As an example of the modifying influence of manures on such a crop, reference may be made to results obtained at Cockle Park, the demonstration farm of the County Council of Northumberland. In 1897 a mixture of grass and clover seeds

TABLE I.—Composition of Seed Mixture used at Cockle Park for one year's Ley.

Species.	Approximate No. of good seeds per acre.	Percentage in mixture.	Weight per acre.
			lb.
Perennial ryegrass	2,400,000	30	$11\frac{1}{4}$
Italian ryegrass	1,600,000	20	6
Red clover	2,000,000	25	$8\frac{3}{4}$
Alsike clover	1,200,000	15	$1\frac{3}{4}$
Trefoil	800,000	10	$2\frac{1}{2}$
Total	8,000,000	100	$30\frac{1}{4}$

was sown equally over a number of plots, and in 1898 the crop was manured, harvested, sampled, and separated into its botanical constituents. The seed mixture was constructed with the view of supplying a total of eight millions of pure germinating seeds per acre, the percentages of the various ingredients being worked out on the basis of "number of seeds," which, where seeds vary in size, is the only rational principle. It is, indeed, the principle adopted by all intelligent farmers and seedsmen; but as "weight" only is usually stated, the importance of "number" is frequently lost sight of. Table I. represents the composition of the mixture, while Table II. shows the weight of the hay, and its composition as regards grass and clover (including trefoil).

The seed-mixture, it will be observed, contained 50 per cent of each of these two classes of plant, and this is approximately the composition of the resultant hay grown under the influence of bone-meal. The dressing of $1\frac{1}{2}$ cwt. sulphate of ammonia

with superphosphate slightly increased the grass and slightly diminished the clover, and when the sulphate of ammonia was doubled the clover was reduced to less than half, with a corresponding increase in the grass. Table II. further shows that superphosphate alone, unsupported by nitrogen, produced nearly three times the weight of clover that was grown under the influence of the same amount of superphosphate, but with 2¼ cwt. of sulphate of ammonia added. As a result of the partial suppression of the clover by the stimulus imparted to the grass by the use of 2¼ cwt. of sulphate of ammonia the yield of the second cut (aftermath) was much reduced. If it be accepted as a fact that hay containing much clover is of higher feeding value than hay containing little clover, then the 80 cwt. of the former—produced without sulphate of ammonia—will, weight for weight, be capable of producing more meat than the 81 cwt. of the latter.

TABLE II.—EFFECT OF MANURES ON THE BOTANICAL COMPOSITION OF SEEDS-HAY AT COCKLE PARK, 1898.

Manuring per acre (besides 3 cwt. kainit).	Yield of first cut.	Yield of second cut.	Total yield	Botanical composition of the first cut.		
				Grass.	Clover	Weeds
	cwt.	cwt	cwt	Per cent	Per cent	Per cent
5½ cwt. bone-meal	51	18	69	49·3	48·5	2·2
1⅛ cwt. sulphate of ammonia and 4½ cwt. superphosphate .	59½	19	78½	52·5	45·6	1·9
2¼ cwt. sulphate of ammonia and 4½ cwt. superphosphate .	65	16	81	76·5	20·1	3·4
4½ cwt. superphosphate	56	24	80	42·4	55·6	2·0

Against the view that the feeding quality of hay and pasture is largely influenced by its botanical composition, we have the interesting figures collected by Dr Fream and Mr Carruthers in 1888, 1889, and 1890. These two investigators examined, by different methods, a large number of pastures admitted to be the best in the British Isles, and they found that there was practically no relationship between feeding properties and botanical composition. Thus in 1888 Dr Fream found that in the herbage of turfs sent from twenty-five of the best grass-fields in England and Ireland, grasses might be as low as 11 per cent and as high as 100 per cent; Leguminosæ might be altogether absent or as high as 38 per cent; while miscellaneous plants, mostly so-called weeds, might be absent, or

might constitute 89 per cent by weight of the whole yield. Mr Carruthers's examination of a large number of pastures led to similar conclusions. More particularly, he found that on many occasions the genus that was most prevalent was Agrostis, a grass usually associated with our poorest pastures; and, even more unexpectedly, it was found that one of the grandest pastures in England was full of squirrel-tail (*Hordeum pratense*).

There would therefore appear to be no room for doubt that two pastures may contain the same plants and yet be of very different feeding value; and, conversely, the botanical composition may be altogether different, while the feeding value may be the same. Apparently, therefore, the natural feeding value of a pasture depends essentially on the character of the soil, and, to a less extent, on the climatic conditions of the locality, though this value may be greatly modified by manurial treatment.

Where two pastures in two distinct districts, or under two distinctly different systems of manurial treatment, show marked divergence in their power to maintain or feed stock, the superiority of the one over the other may be due either to its producing more food or to its producing better food, or, as is most likely, to both of these causes.

When one proceeds to investigate the influence of manures on grass-land, one finds that the problem is by no means so simple as it looks. Even if one is satisfied with determining only the effect of the manures on the weight of produce, one cannot be sure that the weight of hay is a sure index of the weight of pasture. It is not at all unlikely that two equal areas of grass may produce the same weight of herbage, when the plants are allowed to grow unrestrictedly and are cut over when full grown, and yet they may not produce the same weight of material when the herbage is nipped back almost daily under a full stocking of sheep or cattle. And if it is difficult to determine relative weights as affected by manures under the two conditions of hay and pasture, how much more difficult is it to attempt to determine relative values! Botanical and chemical analyses tell something, but they may fail to tell more. The only sure test would appear to be the influence of the "improved" herbage on the animals that consume it, and this is the method of determination adopted in the experiments about to be described.

In the spring of 1896 the County Council of Northumberland entered on a lease for twenty-one years of Cockle Park, a farm of 400 acres situated at an elevation of nearly 400 feet, within four miles of Morpeth. The greater part of the farm consists of grass-land of extremely poor quality, situated on boulder

clay. In its unimproved condition the herbage is chiefly Agrostis, a plant-genus that stock readily avoid if anything better can be had wherewith to satisfy their hunger. Thirty years ago and upwards this land was kept under the plough, and produced fair crops of grain, but when cultivation was suspended it was allowed to go down to grass, usually without any special seeding. Where the resulting pasture is left in its natural state, it grows coarse food of low-feeding value, and is valued at about 5s. per acre per annum.

In the winter of 1896-97 a field of rather over 34 acres was divided by sheep-fences into ten plots of $3\frac{1}{20}$ acres each, the 3 acres being designed for pasturing with sheep, while the sub-plot of $\frac{1}{20}$ acre, which each larger plot contained, was intended for hay. The field from end to end was of practically equal character in point of soil, shelter, and herbage, while each plot was supplied with a stream of running water.

Early in the spring of 1897 lime, potash, superphosphate, and basic slag, where used, were applied, the other substances being put on a little nearer the growing season. In the month of June a special lot of cross hoggs were bought for the experiment, and, with eight of these, each plot was stocked on the 21st of the month. The sheep were weighed individually at the start, at the end of each month, and at the end of the grazing season, which terminated on October 11, having lasted four months.

No further manurial treatment was given for the season of 1898. Early in May cross hoggs were again purchased for the experiment, the plots being stocked on the 16th. As it was now evident that some of the manures had greatly improved certain of the plots, the stocking had to be varied according to the appearance of the herbage, the number of sheep placed upon each plot being determined after inspection by the committee (see note, Table III.) Six weeks later the plots were carefully gone over, when it was found desirable to further increase the stocking of a few of the plots, the final number varying from six to twelve sheep per plot of 3 acres.

This variation in the number of sheep placed on each plot may at first sight appear to be open to objection, but it is of the essential nature of the experiment, and is in strict conformity with grazing practice. When a farmer improves a pasture, he may look for his return either from the better growth in the same number of stock, or from the same individual growth in a larger head of stock, or, as is most frequently the case, from a combination of both results. The grazing season of 1898 extended to five months, terminating on October 3.

By the end of the second season it was evident that the

TABLE III.—Influence of Manures on the Production of Mutton in the Tree Field at Cockle Park.

Results per Acre for the Grazing Seasons of 1897, 1898, 1899.

In 1897 each plot was grazed by 8 sheep for 16 weeks (June 21 to October 11). In 1898 8 sheep were, on May 16, placed on plots 2, 4, 5, 7, 8, 9, 10; 6 on plot 6; and 10 on plots 1 and 3. On June 27 another sheep was added to those on plots 1 and 7, while 2 were added to those on plots 3, 9, 10. The grazing season of 1898 extended to 20 weeks (May 16 to October 3). On May 4, 1899, 6 sheep were placed on plots 2 and 6; 8 sheep on plots 1, 4, 5, 7, 8, 9, 10; and 12 sheep on plot 3. No alterations were made during the season, which extended to 20 weeks (May 4 to September 21). Deducting wool, the sheep cost, per head, 29s. in 1897, 25s. in 1898, and 32s. 6d. in 1899.

Plots.	Treatment *per acre* in three years.	Cost of treatment per acre in three years.	Live-weight increases per acre in—				Live-weight increase per acre in three years in excess of plot 6.		Butcher's valuation per sheep at the end of each season.			Butcher's valuation per acre in excess of plot 6 in three years.	(Net gain (+) or loss (−) per acre in three years as determined by—		Live-weight gain per sheep per week during the season.			Plots.
			1897.	1898.	1899.	Total.	Weight in lb.	Value at 3¾d. per lb.	1897.	1898.	1899.		(a) Weight.	(b) Butcher.	1897.	1898.	1899.	
		s. d.	lb.	lb.	lb.	lb.		£ s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.				
1	Total of 5¼ cwt. decorticated cotton-cake eaten by sheep in 1897 and 1898 (=42 lb. nitrogen), nothing in 1899	32 6	80	144	106	330	192	3 0 0	36 0	31 0	36 0	60 7	+27 6	+28 1	1·9	2·0	2·0	1
2	4 tons common lime for 1897, nothing since	52 0	32	64	47	143	5	0 1 7	32 0	24 0	31 0	13 4	−50 5	−38 8	0·7	1·2	1·1	2
3	½ ton basic slag (=200 lb. phosphoric acid) for 1897, nothing since	22 0	77	171	211	459	321	5 0 4	33 0	34 0	38 0	78 10	+78 4	+56 10	1·8	2·2	2·6	3
4	¼ ton basic slag (=100 lb. phosphoric acid) for 1897, nothing since	11 0	44	113	113	270	132	2 1 3	30 0	33 0	35 0	41 8	+30 3	+30 8	1·0	2·1	2·1	4
5	7 cwt. superphosphate (=100 lb. phosphoric acid) for 1897, nothing since	18 2	56	104	103	263	125	1 19 1	32 0	30 6	33 0	35 0	+20 11	+16 10	1·3	1·9	1·9	5
6	Untreated throughout	..	37	53	48	138	..	..	26 0	28 0	28 0	..	..	..	0·9	1·3	1·2	6
7	7 cwt. superphosphate and 1½ cwt. sulphate of potash (=50 lb. potash) for 1897; potash repeated for 1899	33 6	72	121	107	300	162	2 10 7	32 0	33 0	35 0	49 3	+17 1	+15 9	1·7	2·1	2·0	7
8	7 cwt. superphosphate and ½ ton ground lime for 1897; lime repeated for 1899	38 2	69	119	114	302	164	2 11 3	33 6	32 0	38 0	55 0	+13 1	+16 10	1·6	2·2	2·1	8
9	7 cwt. superphosphate and 97 lb. sulphate of ammonia (=20 lb. nitrogen) for 1897; 70 lb. sulphate of ammonia (=14 lb. nitrogen) for 1899	33 3	79	94	109	282	144	2 5 0	33 0	30 0	34 0	41 6	+11 9	+ 8 3	1·8	1·5	2·0	9
10	6 cwt. dissolved bones (=100 lb. phosphoric acid and 17 lb. nitrogen) for 1897, nothing since	30 7	59	117	106	282	144	2 5 0	34 0	32 0	33 0	46 10	+14 5	+16 3	1·4	1·9	2·0	10

potash, ground lime, and sulphate of ammonia, employed to supplement superphosphate, had produced but little effect, and it was therefore decided to repeat these substances in the spring of 1899. The only other change that was made was to stop the use of cake on plot 1, so that the residual fertility imparted to the land during the seasons of 1897 and 1898 might have the opportunity of showing itself in 1899. In this season 120 half-bred wedder hoggs were purchased, from which eighty were selected for stocking the plots on May 4, the number of animals varying from six to twelve. No change in the stocking was made during the season, which extended to five months, and ended on September 21.

On the last day of each season's grazing Mr M'Bryde, the well-known salesman-butcher of Newcastle, visited the farm and handled and valued each lot of sheep. His valuations and reports are of much interest from the practical point of view, and are essentially confirmatory of the deductions made from the weighing of the animals.

At the end of 1899 a wool-expert—Mr Bell of Hexham—was present to give his opinion of the weight and quality of the wool of the various lots, and this detail of the inquiry has yielded some useful information. For the present, however, Mr Bell's valuations have been excluded from the financial statement.

In 1898 two sheep were removed at the end of the season from each plot, and were slaughtered and reported on by Mr M'Bryde. This plan was also followed in 1899, except that as all the sheep of plots 2 and 6 were lean, none were removed from these plots for slaughter.

The health of the animals has been quite satisfactory. Of the 250 sheep placed upon the plots during the three years, only three have died, while five others have been removed on account of minor ailments. In such cases the animals kept in reserve at once supplied substitutes, which were usually of the same weight as those removed. Any trouble on account of foot-rot has been entirely prevented by walking the sheep once a-month through a foot-bath containing a ten-per-cent solution of copper sulphate.

The sub-plots were, during the first two seasons, upon the same area, but in the third season they were moved to fresh ground. As these plots are designed to yield herbage that shall be representative of a pasture, and not of a hay-field, it is evident that the object would not be attained by continuing them for more than two years (better only for one) on the same area. The herbage thus annually secured has been weighed green, and one-third of the weight taken to represent hay. From the produce of the sub-plots samples have each year been drawn for botanical analysis, and the figures for 1899 show that a marked change has already come over the character of the herbage.

Having thus explained the principles and procedure of the experiment, attention may be given in detail to the results obtained on each plot. For convenience of reference the figures, both for the main and sub-plots, are given in terms of an acre.

Plot 1. *Decorticated Cotton-Cake.*

This plot has received no direct manurial treatment. On the other hand, it is the only plot where the sheep have been supplied with any food beyond that furnished by the herbage. The eight sheep of 1897 and the eleven of 1898 were each supplied with ¾ lb. per head per day of decorticated cotton-cake of known composition, and during these two seasons 16 cwt. were consumed on the plot—that is to say, 5⅓ cwt. per acre. In 1899 the animals received nothing beyond the pasture. In 1897 the sheep getting cake made slightly the largest aggregate and individual gain of any of the lots, but in 1898 they were considerably surpassed by the animals grazing plot 3 (10 cwt. basic slag). During the two seasons when the cake was given its use has proved profitable, and this profit is considerably improved when the residual value of the third year is taken into account (Table III.)

As compared with the unmanured plot (No. 6), the plot where the sheep received cake has in three years given an excess of 192 lb. of live-weight increase per acre, and this at 3¾d. per lb. is worth £3. If from this we deduct the cost of the cake—namely, 32s. 6d.—we are left with a net profit of 27s. 6d. per acre on the three years, or, in other words, of fully 9s. per acre, and this without taking account of any manurial residue that may still exist. If the butcher's values are taken as the basis of calculation[1] the net profit on the use of the cake amounts to 28s. 1d., which is within 7d. of the result obtained by the method of valuation from weight.

The residual effect in 1899 of the cake consumed in 1897 and 1898 was extremely satisfactory. Whereas the six sheep on the untreated ground gave only 48 lb. of live-weight increase per acre, the eight on plot 1 gave 106 lb., the difference—namely, 58 lb.—being attributable to the improvement produced in the pasture by the use of the cake. The gain per head per week in 1899 was 2·0 lb. on plot 1, and 1·2 lb. on plot 6.

[1] In converting the butcher's figures into "rate per acre," I have started with the original cost of the sheep. The alternative would have been to disregard the original cost altogether, and deal only with the final valuation. The two systems give results that never differ by so much as 1s. per acre per annum, so that for practical purposes it is a matter of indifference which method of valuation is employed, but the former would appear to be the more strictly correct.

TABLE IV.—INFLUENCE OF MANURES ON THE PRODUCTION OF HAY IN THE TREE FIELD AT COCKLE PARK. RESULTS PER ACRE FOR THE SEASONS OF 1897, 1898, 1899

The herbage was weighed as soon as cut, and one third taken as hay. The percentage composition is given to the nearest whole number

Plots	Treatment per acre in three years	Cost of treatment in three years	Weight of hay per acre in— 1897	1898	1899	Total	Increased yield per acre in three years	Value of increase at 50s per ton	Net gain (+) or loss (−) per acre in three years	Percentage composition of the hay of 1899 as regards the undernoted plants: Agrostis species	Crested dogstail	Cocksfoot	Festuca species	Yorkshire fog	White clover	Plots
		s. d.	cwt	cwt	cwt	cwt	cwt	s. d.	s. d.							
1	Crushed cake and cake residue	[illegible]	25¾	18½	18¾	63	19¾	[illegible] 5	[illegible]	42	9	5	5	14		1
2	4 tons common lime for 1897, nothing since	52 0	20¾	16¼	12½	49½	6¼	15 7	−36 5	47	15	5	6	7		2
3	½ ton basic slag (200 lb phosphoric acid) for 1897, nothing since	22 0	22½	32¼	30½	85¼	42	105 0	+8[illegible] 0	22	17	9	14	12	8	3
4	¼ ton basic slag (100 lb phosphoric acid) for 1897, nothing since	11 0	16	32	24½	72½	29¼	73 2	+62 2	37	10	8	10	7	7	4
5	7 cwt superphosphate (100 lb phosphoric acid) for 1897, nothing since	18 2	23¾	22¼	17½	63½	20¼	50 7	−32 5	45	[illegible]	5	5	[illegible]	2	5
6	Untreated throughout		22¼	13½	7½	43¼				58	[illegible]	1	6	4		6
7	7 cwt superphosphate and 1½ cwt sulphate of potash (50 lb potash) for 1897, potash repeated for 1899	3 6	17½	17	20¾	55¼	12	30 0	−3 6	40	3	9	5	8	[illegible]	7
8	7 cwt superphosphate and ½ ton ground lime for 1897, lime repeated for 1899	35 2	24¾	20¾	18¼	63¾	20½	51 3	+16 1	33	6	7	8	8	6	8
9	7 cwt superphosphate and [illegible] lb sulphate of ammonia (20 lb nitrogen) for 1897, 70 lb sulph. of ammonia (14 lb nitrogen) for 1899	3 [illegible]	27½	21½	18¼	67¼	24	60 0	−76 9	40	4	5	5	11		9
10	[illegible] cwt dissolved bones (100 lb phosphoric acid, and 17 lb nitrogen) for 1897, nothing since	30 [illegible]	26	23¾	17½	67¼	24	60 0	−29 5	46	2	3	5	5	4	10

As regards the sub-plot (Table IV.), it may be said that in 1897 it received at the rate of 6 cwt. per acre of decorticated cotton-cake crushed into meal and spread on as manure. The hay crop of 1898 was grown on the residue of this application, while that of 1899 was taken from a fresh area that had been pastured during the two previous years. The crushed cake gave a somewhat disappointing return, but the residue of that consumed by sheep raised the yield of hay in 1899 from 7½ cwt. per acre (plot 6) to 18¾ cwt. As a result of the use of cake the percentage of Agrostis has, in the third year, been reduced from 58 to 42, while crested dogstail is raised from 2 to 9, cocksfoot from 1 to 5, and Yorkshire fog from 4 to 14. In neither case does the clover exceed one-half per cent.

The valuers reported: In 1897, "Good coat, evidently in healthy, prosperous condition." In 1898, "Skin shows healthy thriving condition. The sheep have slaughtered quite equal to promise according to handling—that is, their mutton showed a good deal of what we call *sap*, and is therefore fine-flavoured and tender." In 1899, "Sheep in healthy growing condition, wool averaging 3 lb. per fleece, longer and stronger in the staple than in the case of the sheep of plots 2 and 6."

Plot 2. *Four Tons per Acre of Common Lime.*

The lime was applied in the end of January 1897, and up till the end of the third year has had practically no effect. In 1897 and 1899 the limed plot (No. 2) and the unmanured plot (No. 6) carried the same number of sheep, and in both years the rate of progress on the limed plot was rather less than it was on the other. The detailed individual weights of the sheep in 1899 for these two plots are given in Table V. In 1898 eight sheep grazed No. 2 as against six on No. 6, and in that year 64 lb. of live-weight increase per acre was produced on the former plot as against 53 lb. on the latter. This small improved increase is, however, entirely due to the greater number of sheep on No. 2, for it will be seen (Table III.) that in every year the rate of increase per head per week is less in the case of the sheep grazing the limed plot than in the case of those on absolutely untreated ground. Valuing the small increase in live-weight obtained in 1898 at the adopted rate, and deducting the slight losses due to lime in 1897 and 1899, and we are left with a net debit balance against plot 2 of 50s. 5d. per acre in the three years. By the butcher's method of valuation the results on this plot work out at a loss of 38s. 8d. per acre. This is a case where the butcher's figures and ours show considerable divergence, and is evidently due to the fact that the butcher

could not bring himself to believe that the sheep on this plot were quite so bad as they really were

TABLE V.—INDIVIDUAL MONTHLY WEIGHTS OF THE SHEEP GRAZING PLOTS 2 AND 6 IN 1899

Plot 2. *Limed*

Distinguishing No. of sheep	Weight on the dates— May 4	June 1 *	June 29	July 27	Aug. 24	Sept. 21	Total gain
	lb	lb	lb	lb	lb	lb	lb
9	67	79	78	81	84	89	22
8	76	94	91	95	95	104	28
37	78	89	90	91	85	93	15
41	74	91	92	96	100	100	26
85	82	93	96	97	102	108	26
33	67	75	75	78	84	91	24
Average	74	87	87	90	92	97	23

Plot 6. *Unmanured*

Distinguishing No. of sheep	May 4	June 1 *	June 29	July 27	Aug. 24	Sept. 21	Total gain
71	66	84	86	91	93	92	26
77	77	93	94	99	105	100	23
24	73	85	89	91	90	93	20
76	73	86	84	88	90	88	15
89	74	94	95	98	102	102	28
109	76	90	100	102	105	108	32
Average	73	89	91	95	97	97	24

* All weights are fasted, except those of June 1

The botanical analysis of the hay in 1899 shows the following changes, only the more important being noted —

	Agrostis	Sweet vernal	Yellow oat grass	Dogstail	Cocksfoot	[illegible] grass
	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Plot 2, lime	47	0.7	3.7	13.0	5.0	1.0
Plot 6, nothing	58	3.7	1.0	2.0	1.0	1.1

On the whole, one would say from these figures that the lime had influenced the herbage for the better, but if this had really been the case, the sheep would have reflected the improvement

in their rate of progress. The lime has certainly not shown the slightest tendency to stimulate the growth of clover or other Leguminosæ, which are alike scarce on plots 2 and 6.

On the average of the three years the weight of hay obtained from the limed plot is 2 cwt. per acre in excess of the yield of plot 6.

The complete failure of the lime, when used alone, to improve the pasture is one of the most important results of these experiments. An analysis of the soil by Mr S. Hoare Collins shows 9·31 per cent of organic matter (including water of combination), and one would have expected that under such circumstances lime would have produced a considerable effect. The amount of lime naturally present in the soil is 0·685 per cent, which is a fair quantity for land of this class. The explanation of the failure of lime is doubtless to be found in the fact that the soil contains only 0·069 per cent of phosphoric acid, and of this Dyer's method of soil analysis shows that no more than 0·005 per cent is available. That lime can produce a considerable effect in conjunction with phosphate is evident from the results obtained on plot 8, which will be discussed in due course.

Regarding the sheep on plot 2 the valuers reported: In 1897, "Coat dead, lack of evidence of thriving." In 1898, "Not thriving, skin shows want of bloom. Mutton as dry as chips, giving the impression that the sheep were not only not improving, but had the appearance of going back." In 1899, "Sheep in rather better condition than those of No. 6, wool 2½ lb."

Plots 3 and 4. *The Effects of Basic Slag.*

This substance was applied at the rate of 10 cwt. per acre (200 lb. phosphoric acid) to plot 3, while half this quantity was used on plot 4. From whatever point of view they may be examined the results are very striking. Even in the first season the sheep on plot 3 gave nearly as much live-weight increase as those on plot 1, where ¾ lb. of decorticated cotton-cake was allowed per head per day. In 1898, when the effect of the slag was more conspicuous, the twelve sheep on plot 3 actually gave 81 lb. more live-weight increase than the eleven sheep which received cake on plot 1. The average weekly gain per head for the season of 1898 was 2·2 lb. on plot 3, as against 2·0 lb. on plot 1.

In the three years that have elapsed since the slag was applied plot 3 has produced 321 lb. more live-weight increase per acre than plot 6, and this, at 3¾d. per lb., is worth £5, 0s. 4d. When the cost of the manure—namely, 22s.—is deducted, there remains a clear net profit of £3, 18s. 4d. per acre, or rather over

26s. per acre per annum. By the butcher's system of valuation the net profit in the three years is £2, 16s. 10d., or nearly 19s. per acre per annum. This is the one other case where our valuer's figures diverge rather seriously from ours, and here he evidently could not bring himself to believe that the sheep could be so good as they were.

It may be objected that this "profit" takes no account of interest on the extra capital invested in the "slagged" land, nor of extra labour necessary for looking after the greater number of sheep. But, on the other hand, it does not include the unexhausted residues, which are probably quite as great as the past returns, nor does it take account of the value of the grazing during the part of the year that is not embraced by the experimental season of five months.

The general verdict of hundreds of farmers who have inspected the experiments is that plot 3 is worth 25s. per acre per annum more than plot 6, and this is practically the same as the figure (26s.) which we have arrived at by the actual process of experiment.

When we turn to the results obtained on the hay-plot of No. 3, we find that, although these are very satisfactory, they fall short of those obtained from the pasture area. The gross produce of hay in the three years has been $43\frac{1}{4}$ cwt. on the unmanured plot, whereas it has been $85\frac{1}{4}$ cwt. on plot 3. The slag has thus practically doubled the yield of hay, but as it more than tripled the yield of mutton, it is evident that it has improved the quality of the herbage even more than the quantity.

Comparing the results on plots 3 (10 cwt. slag per acre) and 4 (5 cwt. slag per acre), we find that the double dressing has given far more than a double return. If in both cases we deduct the live-weight increase which the unmanured plot produced, from the increase obtained on plots 3 and 4, we get the actual produce due to the manure; and this, it will be seen, amounts to 132 lb. for 5 cwt. of slag, and 321 lb. for the double dressing. Taking the cost of the manure into account, we are left with a profit on plot 4 of 30s. 3d. per acre in three years—when the determination is made by weighing the sheep—or of 30s. 8d. by the butcher's method of valuing. Roughly speaking, this is only about half the net profit got from the larger dressing of slag, and indicates that we had probably failed to reach the maximum limit of profit with a dose of half a ton of basic slag per acre.

It has already been stated that eight sheep grazed plot 4 during the whole season of 1899, as compared with twelve sheep on plot 3, and this heavier rate of stocking might have been thought to discount, to some extent, the benefits of the

extra allowance of slag. That this is not the case—or, at least, that the larger dressing of slag was able to assert its superiority notwithstanding—is evident from a study of the

TABLE VI.—Individual Monthly Weights of Sheep on Plots 3 and 4.

Plot 3.

Sheep No	Weights in lb. on the dates—						Gain per sheep.
	May 4.	June 1.[a]	June 29.	July 27.	Aug. 24.	Sept. 21.	
67	67	80	88	95	108	115	48
84	70	87	98	107	112	123	53
91	70	89	98	111	119	127	57
90	71	91	95	107	116	126	55
73	72	89	96	101	111	119	47
34	72	92	99	110	119	125	53
15	71	91	97	104	113	120	49
19	76	102	106	118	129	138	62
61	76	96	103	113	124	127	51
48	76	96	99	110	122	130	54
107	81	99	108	117	126	132	51
104	79	94	98	108	123	131	52
Average	73·4	92·2	98·8	108·4	118·5	126·1	52·7

Plot 4.

17	84	93	107	110	117	122	38
58	80	92	96	102	108	112	32
64	75	89	93	101	109	117	42
74	71	86	98	103	108	118	47
55	69	90	91	98	111	116	47
53	70	85	92	99	108	113	43
46	71	80	86	96	105	115	44
43	73	84	96	100	112	118	45
Average	74·1	88·1	94·9	101·2	109·7	116·4	42·3

[a] Unfasted.

figures in Table VI., which show that the largest individual gain on plot 4 (47 lb.) was just equal to the smallest individual gain on plot 3.

Comparing the botanical analyses of the two plots getting basic slag, we find that the following are the main differences:—

	Agrostis. per cent.	Dogstail. per cent.	Fescues. per cent.	Yorkshire fog. per cent.
10 cwt. basic slag . .	22	17	14	12
5 cwt. " . .	37	10	10	7

Yellow oat-grass, cocksfoot, and general Leguminosæ were practically alike abundant in both cases.

The valuers reported: In 1897, plot 3, "Coat fair." Plot 4, "Skins almost equal to those on plot 2, but as sheep they are worth less." In 1898, plot 3, "Sheep show good bloom, and are in thriving condition. In my opinion these sheep are the best, both in condition when alive and in quality when slaughtered. They cut up thick in the loins, and would give satisfaction to purchasers." Plot 4, "Bloom fair, room for improvement, vary in quality. I should not like to class them so high as either lot 1 or lot 3 for sap, or for eating purposes." In 1899, "Sheep on plot 3 have evidently thriven and done well. Wool same quality as that of No. 1, but ½ lb. more of it —namely, 3½ lb. per sheep. Sheep on plot 4 have not thriven so well as last, and ½ lb. less wool. On plot 3 seven of the twelve sheep are prime fat, as against two of the eight on plot 4."

Plot 5. *The Effects of Superphosphate.*

This manure was applied in the spring of 1897, the quantity (about 7 cwt. per acre) being so adjusted that the plot received the same amount of soluble phosphoric acid (100 lb. per acre) as was supplied in an insoluble form by the 5 cwt. of basic slag on plot 4.

In the first season the superphosphate had the better effect, but in the next two seasons the slag proved superior, so that on the aggregate of the three years there is only 7 lb. of difference in the live-weight increase of the two plots, but such difference as does exist is in favour of the slag. Had the superphosphate been procurable at the same rate per unit as the slag, the financial aspects would have been in close agreement; but, as it is, the profits from the slagged plot are much superior to those from the plot getting superphosphate, and especially so from the butcher's point of view.

The same result, but in a somewhat more pronounced form, was obtained from the respective hay plots. The main features of the botanical analyses of 1899 are that Agrostis, Aira, sweet-scented vernal, and *Lathyrus pratensis* were decidedly more abundant under the influence of superphosphate than of slag,

whereas the reverse is the case with dogstail, cocksfoot, fescues, Yorkshire fog, and white clover.

The valuers reported: In 1897, "Better bloom than those of Nos. 2 and 4." In 1898, "Sheep not first class, rather dry and chippy in the skin, not so good bloom as those of No. 4. The mutton proved of a class that is in request, having a fair proportion of lean to fat." In 1899, "Sheep on plot 5 appear to have been stationary for some time; those of plot 4 have done better; two prime fat. Wool of No. 5 not so well grown as that of No. 4, and about ¼ lb. less of it."

Plot 7. *The Effects of adding Potash to Superphosphate.*

In the first season of the experiment (1897) sulphate of potash, supplying 50 lb. of potash per acre, was used on plot 7, the manuring in other respects being the same as on plot 5. The effect of the potash was that, in the season of application, it raised the live-weight increase per acre of the sheep from 56 lb. to 72 lb., while in 1898 the increase was from 104 lb. to 121 lb. As the effects, though visible, were not great, the potash was repeated in the spring of 1899, with the result that in that season the yield of live-weight increase was raised from 103 lb. to 107 lb. On the three years, therefore, 100 lb. of potash, costing 15s. 4d., has been accountable for improvement in the weight of the sheep to the extent of 37 lb. per acre, which, at 3¾d. per lb., is worth 11s. 6d. By this system of valuation, therefore, the potash has not paid, though the residues need exert but a small effect in 1900 to clear off the deficit of 3s. 10d.

From the valuer's point of view the potash has acted rather better. Judged in this way the debit balance against this substance is only 1s. 1d. per acre. Plot 7 furnished four fat sheep at the end of 1899, as against two in the case of plot 5, which received superphosphate without potash.

As potash is usually supposed to have a considerable influence on the growth of wool, it becomes specially interesting to see what the expert has to say about the character of the fleeces of the sheep of plot 7. Although the wool that the sheep carried at the end of the experimental season of 1899 represented the growth of only four and a half months, one would expect that if any factor could produce an effect at all, some part of that effect would be clearly manifest at the end of that period. The analysis of the hay showed conclusively that much of the potash has been taken up by the plants, the amount of this substance in the dry produce of plot 7 being 2·43 per cent, as against 1·94 per cent in the case of plot 5. Having regard to the weight of hay produced on the respective

sub-plots, these figures indicate that the pasture of plot 7 contained about 18 lb. more potash per acre than was present in the herbage of plot 5. Apparently, however, this extra potash has had even less effect on the fleece than on the flesh, for the expert's report on the wool of the sheep of plot 7 runs, "Quality fine, but lustre deficient, not so deep and well grown as No. 5; 3 lb. per fleece."

As regards the weight of hay, and its botanical composition, it will be seen (Table IV.) that in two years out of three the addition of potash to superphosphate has reduced the yield, and that the aggregate produce in three years of plot 5 has been 8¼ cwt. in excess of plot 7. To those who have had experience of the application of potash to grass on strong land this result will excite no surprise, and figures in abundance could be produced to show that the yield of hay is frequently depressed by the use of potash under such circumstances. Nor has the potash had much effect on the botanical composition of the herbage, though such change as has been produced is, one would say, in the direction of improvement.

For plot 7 the valuers' reports are as follows: In 1897, "The coat is brighter than in the case of lot 5, and indicates thriving." In 1898, "Sheep in a healthy thriving condition, and equal in appearance to those of plot 3. Carcasses proved fair, but not equal to those from plot 5." In 1899, "Sheep of plot 7 of better quality and thriving better than those of No. 5; four prime fat."

Plot 8. *The Effects of adding Ground Lime to Superphosphate.*

The superphosphate used here was of the same amount, and applied at the same time (spring of 1897) as in the case of plot 5. As an addition to the superphosphate pulverised burned lime has been used on two occasions, half a ton per acre having been applied in the spring of 1897, and repeated in the spring of 1899. Judged by the weights of the sheep, the lime has each year produced a considerable—though by no means striking—effect. The aggregate effects of the lime—namely, 39 lb. live-weight increase per acre—are, in fact, almost identical with those produced by the potash of plot 7. As this form of pulverised lime was charged at £1, it is evident that, from the point of view of animal increase, it has so far been used at a loss.

When, however, the matter is regarded from the butcher's standpoint, the case for the use of lime along with phosphate comes out in a much more favourable light. In each season our valuer has put a higher price on the sheep from plot 8 than on those from plot 5, and especially is this the case in the last

season, when the difference amounted to 5s. per head. Perhaps the most striking result of all was that, at the end of the season of 1899, the butcher found only two fat sheep amongst the eight of plot 5, whereas he found five on plot 8. So impressed was he with the superior excellence of the latter lot of sheep, that he gave it as his deliberate conviction that, had he not known the two lots of sheep to be of the same character to start with, he could not at the end of the season have believed they were originally of the same "class." On the aggregate of the butcher's valuations for the three years, the lime of plot 8 has just paid its way, though this is, of course, without taking any account of residues.

One of the most striking features of the whole experiment was the marked change which, by the end of the summer of 1899, had come over the character of the herbage of plot 8 as contrasted with plot 5. This change is expressed in figures by the botanical analysis, which shows that Agrostis has been reduced from 45 to 33 per cent, with a corresponding increase in cocksfoot, fescues, Yorkshire fog, and white clover. But more striking even than the botanical analysis was the great difference that was at once evident to the most casual observer. Viewed even from a distance of several hundred yards one could at once see that the herbage of plot 8 was of a superior type to that of plot 5, and there is little doubt that this difference will be apparent for some years to come.

When the figures dealing with the yield of herbage on the sub-plot are examined, it is seen that, on the aggregate of the three years, the lime of plot 8 has hardly added to the produce. The improvement in the sheep must therefore have been due to improvement in the quality of the herbage, and not to increase in the quantity. The valuers reported as follows: 1897, "Healthy-looking sheep, coat rather better than in the case of No. 7." In 1898, "Best finished sheep, but rather small in size, which brings down the price a little. The mutton comes out very well indeed, proving quite equal to promise." In 1899, "Sheep better quality than those of No. 3, though not so heavy; five prime fat. Quality and lustre of the wool as good as in the case of No. 3, but $\frac{1}{4}$ lb. less of it—*i.e.*, $3\frac{1}{4}$ lb. As compared with plot 5, the sheep of No. 8 carry $\frac{1}{4}$ lb. more wool."

Plot 9. *The Effects of adding Sulphate of Ammonia to Superphosphate.*

Here, as in the case of plot 5, the superphosphate was applied in the spring of 1897, 97 lb. of sulphate of ammonia per acre being added a few weeks later. Nothing was applied in 1898, but an additional dressing of sulphate of ammonia, to the extent

of 70 lb. per acre, was used in the spring of 1899. The total amount of nitrogen that this plot has received—namely, 34 lb. per acre—is exactly double that contained in the dissolved bones of plot 10.

The effects of the sulphate of ammonia were distinctly recognisable in the weights of the sheep during the two seasons when the substance was used; but the pasture in the intervening year appears to have been rather the worse of the previous season's dressing. On the three years' grazing the sulphate of ammonia, costing 15s. 1d. per acre, has produced 19 lb. of live-weight increase, worth 5s. 11d. From the point of view of weight of animal increase, the manure has manifestly been used unprofitably; and an almost identical state of things is revealed by the butcher's valuation. It may, however, be mentioned that at the end of each season the pasture of plot 9 has been left rather rougher than in the case of plot 5, and this increase of winter food has been taken account of in the grazing of the store cattle that have followed the sheep. But in the three years even this additional credit item has failed to balance the account, so that from no point of view, as tested by grazing, has sulphate of ammonia justified its use.

The results on the hay of the sub-plot are much the same as those secured on the pastured area. In 1897 and 1899 the sulphate of ammonia has slightly increased the yield, while in the intervening season, when no manure was directly applied, the hay crop was smaller on plot 9 than on plot 5. This manure has slightly reduced the percentage of Agrostis and crested dogstail, while it has caused an increase in cocksfoot and Yorkshire fog.

Our valuers' reports are as follows: In 1897, "Appearance of sheep practically the same as the last." In 1898, "Sheep not so well finished as those of plot 8, but in good slaughtering condition. Did not 'die' well; perhaps I expected too much." In 1899, "Two very good sheep, others much back. Wool 3 lb. per sheep; like No. 7 as regards quantity and quality."

Plot 10. *The Effects of Dissolved Bones.*

This manure was applied in the spring of 1897, and contained the same weight of phosphoric acid (100 lb. per acre) as was applied in the form of slag to plot 4, or in the form of superphosphate to plots 5, 7, 8, and 9. Besides the phosphoric acid the dissolved bones also contained nitrogen equal to 17 lb. per acre. The two plots with which this plot may most usefully be compared are No. 4, which got slag alone, and No. 9, which got superphosphate, along with sulphate of ammonia, containing twice as much nitrogen as that present in the dissolved bones.

The action of the dissolved bones, compared with that of the slag of plot 4, is distinctly disappointing. It is true that in two years out of three the live-weight increase of plot 10 has been greater than that of plot 4, but the aggregate live-weight by which, in the three years, the dissolved bones have surpassed the slag is only 12 lb. per acre, of the value of 3s. 9d. As the former manure cost 19s. 7d. per acre more than the latter, it is evident that it has shown a much lower profit. There is satisfactory evidence to show that the small excess of live-weight increase produced by the dissolved bones, as compared with slag, is entirely due to the nitrogen of the bones, so that the bone-phosphate has proved in no way superior to slag phosphate, and this apart altogether from any question of cost.

The butcher's valuations are also distinctly against the dissolved bones—as compared with slag—and this almost to the same extent as the valuation deduced from the weights. In 1897 the butcher put a slightly higher value on the sheep of plot 10, while in 1898 and 1899 his valuation was in favour of the sheep of plot 4. On the three years the butcher's valuations work out at 5s. 2d. per acre more for plot 10 than for plot 4, so that the larger cost of the bones is still far from recovered.

The aggregate effect of the phosphate and nitrogen of the bones of plot 10 compares rather favourably with that of these substances in the form of superphosphate and sulphate of ammonia in plot 9. In the latter case 34 lb. of nitrogen have produced no more live-weight increase than 17 lb. in the form of bone, and as the dressing of plot 9 cost 2s. 8d. per acre more, it is evident that this sum represents the extent of the superior profit of plot 10. The butcher's figures are even more distinctly in favour of dissolved bones (as compared with superphosphate *plus* sulphate of ammonia), for they show that, though costing less by 2s. 8d. per acre, the bones have given 5s. 4d. more of animal value, and have therefore been more profitable to the extent of 8s. per acre.

The effects of the dissolved bones, as tested on the hay of the sub-plot, are very similar to those obtained with the sheep. Compared with the basic slag of plot 4, the dissolved bones of plot 10 have in the three years given a very disappointing return.

The agreement between the hay and mutton yields of plots 9 and 10 is perfect, the same total weight of the two kinds of produce being got from the two plots. On account of their lower cost the profit of the dissolved bones has therefore been 2s. 8d. higher than in the case of the superphosphate and sulphate of ammonia of plot 9.

As regards the effects of dissolved bones on the botanical

composition of the herbage, it will be seen that these are not specially pronounced. Under the influence of this manure Agrostis and Yorkshire fog are fairly abundant, while crested dogstail is distinctly scarce.

Our valuers' reports are as follows: In 1897, "The best sheep of all, except those on plot 1; coat bright; nice healthy appearance." In 1898, "Sheep in fair killing condition; skins healthy; 'died' as well as I expected from their appearance." In 1899, "Sheep of fair quality and in good thriving condition, but rather deficient in weight. Three prime fat. Wool of fine quality but not abundant—2¾ lb. per sheep."

Carcass-Weights.

In Table VII. will be found the carcass-weights of the two sheep removed for slaughter from each plot at the end of 1898, and from eight of the plots in 1899. In the former season two

TABLE VII.—Relationship of Dead-weight to Live-weight, and of Hay to Mutton.

Plots	Treatment	Relationship of carcass to live-weight						Relationship of hay to live-weight increase on the average of three years		
		In 1898			In 1899			Per cent in excess of plot 6.		
		Average live-weight	Average dead-weight	Per cent of mutton	Average live weight	Average dead weight	Per cent of mutton	Hay	Live-weight increase	lb of hay to 1 lb. of live weight increase
		lb	lb		lb	lb				
1	Cake . . .	103	54	52	115	53	16	16	130	21·1
2	Lime . .	81	37	46				14	4	35·8
3	1 ton slag .	108	56	52	127	57	45	97	233	20·8
4	½ ton slag . .	101	47	47	117	53	45	68	96	30·1
5	7 cwt super.	101	52	51	111	53	16	47	91	27·0
6	Nothing . .	98	50	51						35·1
7	Super. + potash	104	54	52	120	53	11	28	117	20·6
8	Super. + lime	112	56	50	122	54	44	18	119	23·6
9	Super. + ammonia . .	98	50	51	126	57	45	54	104	26·7
10	Dissolved bones .	107	54	50	122	57	46	51	104	26·7

sheep were slaughtered from every plot, including plots 2 and 6 but in 1899 it was deemed undesirable to kill any from these two plots.

It cannot be said that the figures dealing with this part of

the experiment tell a great deal. The most notable point in 1898 was the very small proportion of "dead" to "live" weight in the case of the sheep from plot 2. In the same year it will be noted that the cake-fed animals of plot 1 killed no better than some of the others.

In 1899 none of the sheep weighed well when dead, but in this respect there is little to choose between the different lots. The sheep that produced the relatively heaviest carcass in that year were two from amongst thirteen that had been kept in reserve for the purpose of replacing any that had to be withdrawn in the course of the experiment. These animals had a much wider extent of grazing-ground than those on the plots, and although they did not give quite such a high rate of weekly gain in live-weight for the season's grazing (2·52 lb.) as did the animals of plot 3 (2·63 lb.), they yielded 52 per cent of carcass as contrasted with 46 per cent in the case of the best of the experimental lots.

The butcher's general report on the animals that he slaughtered in 1899 was as follows: "Reserves are the best mutton. Nos. 1, 3, 4 are next in order, followed by No. 10. Nos. 5, 7, 8, and 9 are as near alike as need be. As to the whole, they are very much like most of the sheep this dry season—they kill with a want of kidney suet, and weigh badly."

Relationship of Hay to Mutton.

The last three columns of Table VII. deal with a more interesting feature of the experiments. It is impossible to tell what actual weight of pasture each lot of sheep has consumed each season, but as the hay obtained from a sub-plot has annually been weighed, it is easy to tell *in terms of hay* what weight of pasture each lot of sheep have consumed. If the weight of hay thus obtained be divided by the live-weight increase produced, we can ascertain the weight of pasture, calculated as hay, necessary to produce 1 lb. of animal increase. In this connection we need not consider plot 1, for there the sheep, during two seasons, were allowed cake in addition to pasture.

The figures relating to this aspect of the experiments are shown in the last column of the table, where it will be seen that in the case of plot 2 (lime only) it took pasture equal to 38·8 lb. of hay to give 1 lb. of live-weight increase. The produce of the unmanured plot (No. 6) was slightly more nutritious, for there the pasture equivalent of 35·1 lb. of hay sufficed to improve the fasted weight of the sheep by 1 lb. The most valuable herbage, from the meat-producing point of view, was grown on plots 3 and 7, where less than 21 lb. of pasture, calculated as hay, sufficed to give 1 lb. of animal increase.

This matter may be looked at from another, though closely related, point of view. In the first column of the second division of the table figures are given which show the percentage by which the produce of hay on the various plots is in excess of the yield of the unmanured plot. Thus in the three years sub-plot 2 has given 49½ cwt. of hay per acre, as compared with 43¼ cwt. on plot 6. The dressing of plot 2 has thus increased the hay crop by 14 per cent. In the case of plot 3 the aggregrate produce of hay is 85¼ cwt., which is 97 per cent more than the crop of plot 6. We can also make similar calculations in the case of the animal increase obtained from the main plots, when we get the figures shown in the second-last column.

A comparison of these two sets of percentages brings out some interesting and useful information. Amongst other things it will be observed that only in the case of plot 2 (lime alone) has the manure had more effect on the weight of herbage than on its feeding properties. In all other cases the manures have improved the quality to a greater extent than the quantity. Thus, whereas the half-ton of slag has raised the weight of hay by 97 per cent, it has raised the weight of animal increase by 233 per cent. The superphosphate of plot 5 has been the means of producing 47 per cent more hay, but 91 per cent more "mutton"; while the superphosphate and potash of plot 7 has had four times as much influence on the sheep as on the weight of herbage.

These figures clearly point to the conclusion that the value of the hay obtained from the different plots must, in most cases, have varied greatly, and that it is not by any means a satisfactory plan to put a uniform price per ton on the herbage of the various plots, as has been done in Table IV. It is also evident that the hay, as a whole, has not been worth 50s. per ton for consuming purposes; or, if this figure includes something considerable for manure, then something should also be credited to the pasture on this account. When the final report of the experiment comes to be written this matter will have to be carefully considered, but for the present the figure adopted as the value of the hay gives us a means of comparing the relative financial results of the various plots, and by many this will be deemed sufficient.

LESSONS FROM A MILK RECORD.

By ROBERT SHANKS, Woodend, Bigrigg, Cumberland.

DURING the last ten years there has been extraordinary development of the dairy industry. In the course of this development the produce of the dairy-farm has had to undergo investigation under all manner of circumstances—on the farm, in the laboratory, and under the powerful microscope of the bacteriologist. Although the chemist and man of microbes or bacilli have done much to elucidate matters of scientific interest, yet nothing excites deeper interest in the dairy-farmer than bringing to his notice some simple method of working whereby he is able to improve the "output" of his herd.

Our grandfathers had neither desire nor encouragement to feed dairy cows in winter, nor had they the knowledge how to do it, while additional diet during the grazing months was seldom thought of. Now that winter dairying has become so popular, and the study of suitable food developed into a science, we have undoubtedly a larger yield of milk per cow per annum than we had even twenty years ago. Estimates are sometimes given as to the increase of milk-yield, but these estimates can only be mere suppositions; there are so many idiosyncrasies to be taken into consideration that the figures are only approximate, and misleading at that. If milk records had been kept in the past to the same extent as they are now, it would have been possible for us to give figures of comparative reliability.

The advantages derived from a properly kept record are manifold. For this reason all dairy-farmers are recommended to keep a record of each individual cow; but few, exceedingly few, attempt this, and the publication of records is mainly left to men of independent means who do not farm for a livelihood, or the volume of figures is compiled by managers of county council farms.

How to keep a Milk Record.

When it has been decided to undertake the work, what, then, is the best method of procedure? Measuring the milk is out of the question, even with the cumbersome milk-cans sold for the purpose and containing marks on the inside indicating gallons or parts of a gallon contained. In ordinary cases, when the milking is done properly, there is always a certain amount of froth, and with this hindrance it can be readily understood that measuring, in whatever form, is bound to be misleading.

The simplest way is to weigh the milk on a spring balance, and if the scale is set so that no deduction is necessary for the can which is in use, so much the better. An important point to be decided is, How often should the weighings be taken in order to give fairly accurate totals? Many enthusiasts recommend daily weighings, and this, I maintain, is sufficient to frighten any ordinary farmer from tackling the compilation. Speaking as a farmer, I have followed the practice of weekly weighings for the last five years, and at times have found this to be troublesome and occasionally exceedingly annoying, especially in hay-time and harvest, when all hands possible are at outside work of an important character.

Monthly Weighings.

In order to lessen the labour, weighing on the 1st and 15th of each month has been found to supply pretty reliable figures, and I see no reason why monthly weighings should not be given a trial. In fact, our American cousins found that weighing monthly gave 96·4 per cent of the total milk, and this, I think, can be considered near enough for any farmer, whatever the scientific man has to say to the contrary. The less work advocated the better, if we are sure the figures are right, because then we would have all the greater influence in inducing others to keep milk records.

In the many records published from time to time, with but one or two exceptions, the most interesting column of figures is omitted, that of the percentage of butter-fat. When this is obtained, along with the yield of milk in pounds, and the quantity of butter produced worked out, the comparisons between yield of milk and production of butter are educative and in many instances startling.

The Butter-Maker.

Unless a systematic method of butter-fat testing is adopted, the figures are of no value to the butter-maker. The milk-seller can afford to ignore quality unless he is paid so much per gallon, according to the percentage of butter-fat his milk contains. When this is the case he is placed exactly on the same footing as the butter-maker. The reason why so many milk records have not the percentage of butter-fat attached may be on account of the produce being sold off the farm in its raw state, and if this is so, we cannot expect a column revealing the quantity of butter yielded per cow during her milking period.

When it is known that so many causes—such as rough

treatment, exposure to rain or rough weather, change of diet, change of milkers, rapidity of milking, length of interval between milking, and unusual excitement or sickness—affect temporarily the richness of a cow's milk, it will be readily understood that it is an extremely difficult matter to know when and how often to test, in order to arrive at fairly reliable figures. While the causes above enumerated affect the quantity and quality of the produce, it is the case that some cows' milk vary considerably without any apparent cause. Here again we have difficulties to face, and it is therefore perfectly evident that "the test of a single sample, drawn from a single milking or day, will not of necessity, or indeed usually, give trustworthy results."

Test-Tubes Unreliable.

We have now known for a good few years that cream-tubes are absolutely unreliable. It may happen that two cows of the same breed, and getting identical treatment, will each yield a product which will act differently when set in pans for cream-raising. The percentage of fat in each case may be equal, but the cream percentage may show a wide difference on the graduated test-tubes. In 1894 I worked out the following comparisons, and the figures given are the average of monthly tests taken during the whole of the milking period.

Cow.	Per cent of cream.	Per cent of butter-fat.
Fanny .	10·5	3·15
Gip . .	13·4	3·78
Dainty .	11·5	3·22
Molly .	9·16	3·92
Rose . .	11·35	3·67
Salmon .	10·4	3·5
Spark .	11·77	3·88
Nancy .	12	3·75
Dandy .	9·7	3·4
Jean . .	8·7	3·28
Swing .	6·07	3·2
Young Nancy	5·2	3·8
Jersey .	20·3	5·6
Tidy . .	4·7	4·02
Spot . .	9·83	4·4
Bonny .	10·6	3·82
Clara .	10·64	3·9
Ada . .	10·75	3·22
Marly .	10·25	3·5

From the above the two most erratic examples are the adjoining cows Jersey and Tidy. During the summer the milk of these two cows was set in separate pans for a period of twenty-

four hours; the cream was then taken off and the residue tested. The skim-milk of Jersey registered ·2 per cent fat, but the quantity in Tidy's was 1·2 per cent. I wonder if the separator would treat these two milks alike—that is, Does the application of centrifugal force drive nearly the whole of the butter-fat into the cream-exit, in either case? I may be mistaken, and place myself open to correction, but this is one of the reasons I consider why we get an increased yield of butter by the use of the separator. The creamometer can only be instructive to those who follow up the old-fashioned method of cream-raising—viz., the pan system.

Number of Tests required.

Since 1890, when Dr Babcock gave to the world his butter-fat testing-machine, we have had several reliable inventions placed in the market. Given one of these, one may ask, What is the number of tests required during the milking period in order to obtain fairly reliable figures? It has been proved by careful experiment that monthly tests are pretty accurate; and this is the way I have been working for the last five years, always careful to test the same cow's produce morning and evening alternately, in order to, as far as possible, avoid any discrepancy.

From experiments conducted at the Illinois experimental station, it was found that with monthly tests the butter-fat worked out to 97 per cent of the total produce—surely near enough for any farmer. In spite of this many busy farmers would never think of following the above practice; the labour must be cut down to a practical limit, and until this is done we cannot expect milk records to be popular.

It has been suggested that the following method of testing might be reliable enough for ordinary work—viz., a composite sample from a week's milk to be taken about three months after calving, with a pinch of bichromate of potash or some other preservative added to keep the milk from coagulation. In order to ensure that the figures be as reliable as possible, care must be taken not to sample when the cow is in the flush of her milk on pasture. She should be tested either before she is turned out to grass or after the luxurious growth has gone.

Precautions to be taken.

Just a few words on the precautions to be taken when drawing a sample of milk for testing purposes. I find the best way is to take the sample immediately after milking each cow to be tested. If the milk is allowed to stand but for a quarter or

half an hour, it must be poured from one vessel to another at least four or five times before the sample is drawn. To prove how far the figures might be misleading if this precaution is not attended to, some time ago I took a quart of new milk at random from a quantity as it came from the byre. This was placed in a jug 6 inches deep, and let stand for half an hour. A sample was then taken from the bottom, also one drawn within 2 inches off the top. After testing, the following was the result:—

	Per cent fat.
Bottom	3·15
Middle	3·5

The milk was then thoroughly mixed—poured from one jug to another six times—a sample drawn immediately and analysed, with the following result:—

Per cent of total solids .	12·4
Per cent of butter-fat .	4·15
Per cent of non-fatty solids	8·25

The difference between the percentage of fat in the mixed sample and that drawn from the middle can easily be accounted for, because after standing for so short a period as half an hour a cream was quite perceptible on the top, and when this was mixed with the whole the butter-fat in the milk was bound to register higher after being tested.

The Milk Record.

I do not give particulars of each animal belonging to the herd —which consists of from twenty-five to thirty cows—but only averages for the last five years.

	1894.	1895.	1896.	1897.	1898.
Average number of days in milk . . .	286	290	267	274	289
Daily average of milk in pounds . . .	24	22·3	23·9	21·6	22·1
Total average of milk in pounds . . .	6864·5	6466·6	6257·6	5918	6386·9
Average per cent of butter-fat . . .	3·67	3·68	3·66	3·68	3·45
Average quantity of butter in pounds yielded per cow . . .	274·7	260	251·4	238·4	246·6

The decreased yield of 1897 can easily be accounted for. Just after being turned out to grass early in May the whole of the herd was more or less affected by what we thought was lead-poisoning, and one cow died. This was the means of giving the cows a check at the most important part of their milking period, and when this misfortune happens every dairy-farmer knows that the milk yield never comes back to the normal that year.

AVERAGE PER CENT OF BUTTER-FAT IN MILK.

	1894.	1895.	1896.	1897.	1898.
January	3·58	3·81	...	3·73	3·3
February	3·63	3·66	3·3	3·64	3·24
March	3·15	3·55	3·3	3·62	3·35
April	3·37	3·45	3·1	3	3·3
May	3·55	3·54	3·25	3·5	3·77
June	3·51	3·7	3·54	3·55	3·45
July	3·49	3·5	3·6	3·73	3·73
August	3·68	3·72	3·66	3·57	3·8
September	3 08	3·9	4·08	3·93	4·17
October	4·03	3·8	4·4	3·8	3 48
November	4·4	4·04	...	4·05	3·84
December	...	...	...	4·06	3·61

These figures are arrived at by taking the average of the whole of the monthly tests.

From the last table given it will be seen that—with the exception of the year 1898—the milk was richest in the latter part of the year, when the majority of the cows were pretty far on in the period of lactation. It is the old tale retold, "When the quantity of milk given decreases the quality increases." The reason why the averages of 1898 work out a little lower is because in October, November, and December back-end calvers came in, and these were included among the averages with their large flow of poor milk.

The above figures make no pretence to absolute accuracy, and may therefore be viewed by some enthusiasts in a doubtful manner; nevertheless, to the farmer they may be classed as sufficiently reliable. In addition to the individual peculiarities of each cow, Mr Spier has shown us (see 'Transactions of the Highland and Agricultural Society,' 1897 and 1898) that different foods have their own peculiar effect upon the churnability of the produce, also the temperature at which it ought to be churned. When these idiosyncrasies are taken into consideration, the man who attempts to draw up an absolutely reliable record has no easy task before him when the pounds of butter column has to be filled in. In fact it is a practical impossibility. There is no

getting away from the butter-fat tests, and the comparisons are interesting, because all the butter is produced under identical conditions; therefore, as far as comparison goes, the figures are trustworthy.

All the above cows are cross-breds, being graded from Ayrshire dams and always served by a Shorthorn bull. Many in the herd now are the third, fourth, and fifth cross.

System of Feeding.

All that is attempted in the way of feeding is to keep the cows in perfect health while being house-fed, and to turn them out in fair condition to grass in the month of May. For this reason the average yearly yield is not high, but when comparison is made with the figures from an ordinary Shorthorn stock in Cumberland, I find the cross-breds take the lead, and are at the same time considerably less in weight. Before calving no concentrated food is given, but oat-straw *ad lib.* with one foddering of hay, in addition to from 30 to 56 lb. of roots per day, according to what we have at our disposal. When in full milk the winter ration in addition to straw and roots is 8 or 9 lb. of concentrated food, consisting of crushed oats and decorticated cotton-cake, thoroughly scalded and mixed with chaff; this given twice daily, morning and evening. After testing numerous mixtures, I consider the above one of the best for maintaining the quality of the butter when the cattle are house-fed.

Again I must allude to Mr Spier's food experiments. He found that oats and decorticated cotton-cake produced a firm butter, and of better flavour than most of the foods tested. They also gave a milk from which a high percentage of fat may be recovered in the butter. As little as ·3 per cent of fat, and less, was found in the butter-milk, while the percentage in the butter-milk from some foods ranged from ·6 per cent upwards. This is an important consideration to the butter-maker.

During the three principal grazing months—June, July, and August—the stock receive nothing but what they can gather on the fields. After this cabbages or tares are given, in addition to the pasture, up to November, when the majority are dried off.

Young Cows give the richest Milk; old Cows the heaviest Yield.

It is a recognised fact that cows give richer milk when young than they do after they have reached the age of eight years or upwards. The first of the two following tables gives the quantity of milk yielded in pounds—the figure after each cow's name in the first column representing the number of calves the

cow had produced up to 1894, and the succeeding table the average percentage of fat during the respective years:—

Cow and number of calves in 1894.	Yield in 1894.	Yield in 1895.	Yield in 1896.	Yield in 1897.	Yield in 1898.
Dainty (4) . .	7221	6965	6744	5373	7234
Molly (4) . . .	8580	7672	7946	9000	9446
Salmon (3) . .	7500	6859	7081	6929	7905
Spark (1) . . .	5326	6740	7241	7080	7847
Swing (2) . . .	4949	6675	6854	7033	7914
Nancy (2) . . .	5712	6785	6556	6265	9472
Spot (4) . . .	6750	6415	5904	6578	...
Bonny (1) . .	5664	5115	6147	6805	5402
Ada (4) . . .	8678	7206	7750	7452	7096
Tosh (1) . . .	...	6384	5734	6480	6932
Ginger (1) . .	...	5939	5778	6301	8057

PERCENTAGE OF FAT.

Cow.	1894.	1895.	1896.	1897.	1898.
Dainty	3·22	3·16	3·3	3·3	2·82
Molly	3·92	3·46	3·4	3·65	3·9
Salmon	3·5	3·55	3·9	3·36	3·25
Spark	3·88	3·96	3·7	3·56	3·26
Swing	3·2	3·21	3·37	3·37	3·11
Nancy	3·8	3·5	3·7	3·75	3·58
Spot	4·4	3·8	3·45	3·5	...
Bonny	3·82	3·65	3·35	3·56	3·81
Ada	3·22	3·3	3·24	3	2·8
Tosh	...	3·1	3·49	3·59	3·47
Ginger	...	3·45	3·5	3·58	3·4

The poor milk of Dainty and Ada during 1898 is striking, and particularly so when the following figures are the averages of eight monthly tests:—

Average per cent of butter-fat first year	. .	3·59
Average per cent of butter-fat five years later	.	3·36
Average yield of milk in pounds first year	. .	6610
Average yield of milk in pounds five years later	.	7626

As I have said before, reliability is a difficult matter, but when we begin to take averages such as the above, some reliance may be placed in the figures, considering the number of butter-fat tests taken (somewhere between four and five hundred), along with the weekly milk-weighings from the eleven cows.

As is seen from the above, the lapse of five years has worked a change both in quality and quantity. The per cent of fat

has fallen ·23, but the weight of milk given during the milking period has increased over 15 per cent. At the commencement of keeping the record in 1894 it took 25 lb. of milk to make 1 lb. of butter, and with the same cows five years later the quality had degenerated so much that 27½ lb. were required to give the same result:—

Average number of pounds of butter from eleven cows in 1894	260
Average number of pounds of butter from same cows in 1898	277·5

Taking the average price of butter per pound at 1s. 1d., according to the figures given, the aged cows are worth about 19s. more per annum to the butter-maker than the same cattle were five years previous, in spite of the poorer milk given. If the feeding value of the extra separated milk (1d. per gallon) is added, we get the old cows worked out to be £1 per year more value.

Abortion and its effect on Milk Yield.

The terrible scourge of abortion is so prevalent amongst dairy stock that the loss through decreased milk yield alone is generally looked upon as considerable. How much the loss really is we can only surmise. I will attempt to throw some light upon this point by giving the following figures. The total quantity of milk given is hardly a proper criterion when making comparisons, because the aborted cow is, as a rule, allowed to run for a longer period after calving than she would otherwise be permitted to do before service, and this gives a lengthened period of lactation. For this reason I have not put down the totals, but the daily averages, when abortion takes place, and when the same cow does not abort:—

Cow.	Daily yield when aborted. lb.	Daily yield when no abortion lb.
Dainty	26·5	32·9
Salmon	25·6	25·2
Topsy	16	15·4
Swing	19·4	26·7
Bonny	17·5	22·6
Nancy	23	23·5
Marly	28·4	29

Cow.	Average per cent of fat in milk when aborted.	Average per cent of fat in milk when no abortion
Dainty	2·82	3·3
Salmon	3·25	3·9
Topsy	3·5	4·3
Swing	3·2	3·21
Bonny	3·65	3·35
Nancy	3·5	3·7
Marly	3·47	3·5

	lb.
Average daily yield when aborted . .	22·3
Average daily yield when no abortion . .	25
Average per cent of fat when aborted . .	3·34
Average per cent of fat when no abortion .	3·6

These figures show that abortion is the means of substantially lowering the yield of milk, besides decreasing the butter-fat over ·2 per cent. Assuming 6000 lb. to be a fair production, we find the decrease, calculated over an average milking period, works out about 60 gallons. From this the pecuniary loss is easily arrived at, and the cheese-maker, butter-maker, and milk-seller all sail in the same boat with an actual loss of from 25s. to 30s. per cow per annum.

Food and Butter-Fat.

At the commencement of this paper I mentioned some of the causes which affect both quality and quantity of milk. We have still with us the controversy as to the relations between food and butter-fat, and from the many experiments conducted throughout the world we have to face a certain amount of contradictory matter. These conflicting statements may be, and are no doubt, due to many causes. In some cases the closer they are examined the more inexplicable they become. It is the nervous system of a dairy-cow which influences the "output," and the mere fact of changing the food given to the animal upsets calculations for a few weeks, until the nervous system has dropped back to its normal condition. Every dairy-farmer has noticed that a sudden change of diet has an effect on milk yield. If the quantity rises, testing will reveal that it is at the expense of quality; on the other hand, if the yield decreases, the percentage of fat will rise in proportion.

During the month of March 1898, when the cows were fed on the concentrated diet of crushed oats and decorticated cotton-cake, the average percentage of butter-fat in the milk was 3·35. In April, maize-meal took the place of oats, and the figures of the first week, after this change took place, revealed that the quantity of milk had been increased by 15 per cent. In spite of this, the butter actually given up by the milk fell to the extent of 3 per cent. Needless to say after two or three weeks both milk and butter dropped back to the normal. So much for the temporary influence of food; but let us look a little further into the matter. I just take a few figures to show that in our case at least food does not permanently influence the percentage of fat.

Average per cent of fat in the whole milk for the last four years, during the months of—

April	3·23	September	3·75
May	3·46	October .	4·01

Increase for May over April .	·23
Increase for October over September	·26

I take the above months, because during April and October the cattle are stall-fed, and in May and September they are on splendid pasture, so in this case we have two extremes of food. It will be noticed that the averages from these large number of tests tend to confirm what is now believed by many of the "leading lights"—viz., that food has little or no permanent influence on the quality of milk. We generally find, however, that the quality increases with the period of lactation, and that this increase is pretty gradual.

Milking.

At all times and in all seasons we hear about the dairy-cow and her management, how to get the most out of her by judicious feeding and careful handling; but what to my mind is of the most paramount importance is milking. What could be more annoying or distressing to the level-headed farmer than to know that often his well-cared-for cows are not clean milked? Undoubtedly the art of milking is fast dying out, and those interested will be glad to see that the British Dairy-Farmer's Association have decided, for the first time, to give prizes for the encouragement of this art. It is as essential to have a good milker as it is to possess a cow which gives rich milk. The dairy-farmer has to face the difficulty every year to get a sufficient number of competent hands. I have for years watched closely milking as it is done in this county (Cumberland), and I am convinced the loss is so great through slipshod work that I dare not begin to estimate. A good milker will get more milk and richer milk than one who does not put "life" into his work, and I do not think I am exaggerating when I say that uninterested manipulators who do justice to the cow are the exception rather than the rule. The majority of them when placed down to a heavy milker, or one the least little bit "tough," do not take all the milk away, and it is here where the lazy work does mischief. Never keep a cow bad to milk, is the advice of experienced farmers; get quit of her, because most milkers will not do her justice.

When both weighing and testing, I have tried to keep an eye on the average milker, and watch the result when a good manip-

ulator follows an amateur the following milking. We have had occasionally the result of Continental experiments set before us touching upon this point. They are all unanimous in their findings, that there is nothing beats rapidity of execution and thorough stripping. The next table is drawn up at random, taken from the record sheets, and the figures themselves are sufficient proof that good milking is an absolute necessity if successful and profitable dairying is to be carried on:—

Cow.	Per cent of fat in milk when work done by a poor milker.	Average per cent of fat in milk for the whole year.
Darky	2·5	3·5
Ada	2·4	3·2
Tosh	2·6	3·47
Ginger	2·7	3·4
Swing	2·2	3·11
Salmon	2·5	3·25
Spark	3·3	3·62

The next table of figures shows the great contrast when the milk is tested the following milking after a poor milker has been at work; Sir Charles Cameron has shown us that butter-fat percentage figures can be as erratic if the period between milking is eight and sixteen hours respectively:—

Cow.	Per cent of butter-fat with poor milker.	Per cent of butter-fat twelve hours after, when milked properly.
Ellen	1·3	5
Darky	2·5	3·3
Ada	2·1	3·1
Ellen	1·6	3·9
Tosh	3·2	4·6
Ginger	2 5	4·3
Dainty	2·5	4

When we compare the first column of figures in the former table with the average per cent of fat during the whole milking period, it shows a drop of ·76 per cent of fat through slipshod work. In the latter table we naturally have greater extremes. The averages tell us that a good milker following a moderate one gets 1·8 per cent more butter-fat in the produce.

In addition to the above, it must be admitted that we occasionally come across a low percentage of fat for which we cannot account. The food may be the same, climatic conditions are to all appearances perfect, the cow is healthy, milking is done regularly and properly, but in spite of this an abnormal percentage of fat presents itself which cannot be accounted for. Cases such as these often crop up. This is one of the difficulties which baffle the most careful experimenters.

Selecting a Profitable Cow.

The selection of a profitable cow is not an easy matter for the dairy-farmer. It is quite a common experience to see in a herd a great big fine-looking animal not worth house-room, whereas her neighbour may be worth several pounds a-year more to her owner, and would probably bring £8 or £10 less in the open market. To those who rear their own stock, milk records are recommended as a means whereby both quantity and quality of milk can be increased, if proper selection is adopted. On farms where testing is done regularly (I wonder what percentage of dairy-farmers in the kingdom follow this practice?) the farmer can have no doubt about the respective merits of his animals; but what about the bull in use? He, too, should be carefully selected, or he may upset your endeavours to no little extent. When we come to study the sire and his predecessors, viewed from a dairyman's standpoint, we have, as a rule, nothing to work upon. To obtain a Shorthorn bull with a pedigree as long as your arm is not a very difficult matter; but when the milking properties of his dam, and particularly the quality of her produce, is inquired into, the intending purchaser is placed in a dilemma—a dilemma which ultimately ends in a random shot at a bargain. Among the Shorthorns we have many cows with deep milking properties; but, on the other hand, there are many fashionably-bred animals kept for breeding purposes which a dairyman would not retain for a day. Out of these there are bulls sold at fancy prices, and this kind of work only tends to spread the rearing of unprofitable dairy animals.

Before purchasing the bull now in use here I had the opportunity of testing his dam's milk on two separate occasions, and the average per cent of fat of these duplicate tests stood at 4·5. I have purchased another youngster which has a most creditable pedigree as far as milking properties go, both as to quantity and quality. Now that we have got what we were hunting for, three more years will have to elapse before we can commence to witness the sire's effect upon the quality of milk produced.

It is often said that the best cows are most subject to ailments and ill-luck, which mean a decreased flow of milk. A heavy milker runs the risk of an attack of milk-fever, abortion steps in and sends to the wind your calculations and arrangements, and sometimes the pick of the herd persists in presenting you with a bull calf instead of a much-prized heifer. If the tuberculin test is applied and eradication of tuberculosis attempted according to the recommendations of Bang, we have another impediment which baffles the most enthusiastic, and makes years of careful selection a necessity. Given these as

a few of the adversities a dairy-farmer has to contend with, it stands to reason that the selection and work attached to raising, to any appreciable extent, the yield and quality of the milk from a herd, mean the careful and assiduous attention of many years.

THE DANGERS OF WATER-DRINKING.

By Professor W. Owen Williams, New Veterinary College, Edinburgh.

The goodness of water for human consumption has ever been carefully attended to, but to that for the lower animals little heed has been paid; in fact, I may say with considerable truth that anything *fluid* has been considered as being equivalent to water for them. No doubt the reason of this has been that the very worst of water seldom kills immediately; and in the cases of death in lower animals, it has usually been the custom to blame anything but the water.

Water, as studied from a health point of view, requires to be regarded from a chemical, a physical, and a biological aspect. Firstly, as chemically considered, water itself is an invariable and constant compound, and it really is its contents in solution or suspension that the chemist has to deal with. These substances may be vitalised, and be of the nature of germs or parasites, or they may be dead organic matter, or salts in solution or suspension.

A good water should be limpid, odourless, and tasteless, and on standing for a little time should throw down no deposit; but limpidity is no guarantee of purity, as some waters which even sparkle may contain vitalised and dangerous substances.

Waters are known as soft and hard, and these qualities are due to the presence or absence of certain salts in them—such as the sulphate or carbonate of calcium, carbonate, sulphate, and chloride of magnesia, which give hardness to water. The absence of these salts occurs in soft waters, and can be recognised by the effect of such waters in a soap solution—soft water producing a lather quite readily, and hard water consuming a lot of soap before lathering.

Water, again, has another attribute, and that is its *agreeableness*—this being due to a certain amount of aeration with atmospheric air and the presence of a limited quantity of mineral matter held in solution. Generally speaking, these salts, unless in large quantity, are not looked upon as dangerous, as they are

usually the carbonates—lime and magnesia—and sulphates, with alkaline and earthy chlorides, and from 20 to 30 grains per gallon of these mineral impurities would not be looked upon as deleterious; but should they be the salts of metals then they are a source of danger. It is when we come upon *ammonia* and *nitrates*, resulting from the decomposition of albuminoid matters, that we consider such mere "chemical impurities" as unwholesome and harmful.

Sources of Water.

The source of water-supply is a subject more connected with physics and geology than within the limits of this article. The great aim in obtaining a supply of good water is to get it as free as possible from any dangerous ingredients, such as poisonous salts, nitrates, and organic matter.

Rain-water may in some few parts of Britain (but rapidly growing fewer) be directly used, as it is very free from substances in solution, but when collected in the neighbourhood of towns is very often contaminated and rendered unsafe.

The best source of water, failing pure rain-water, is from the primitive rocks, and as far away as possible from lands under cultivation. There is no greater danger than obtaining water from shallow, sluggish, or almost stagnant watercourses or from shallow wells.

Storage of Water.

As regards the storage of water, lead cisterns should be avoided as well as lead pipes for the conduct of water. Should the water stored in such a cistern or conducted through such a pipe become contaminated with decaying animal or vegetable matter, the lead is readily dissolved, and the danger becomes immediate from a double cause—namely, lead and organic impurities. It must be noted that there are two classes of organic impurities: firstly, and a harmless one in itself if not present in too great a quantity, dead vegetable matter, such as is seen in peaty waters; and secondly, and the most highly dangerous, *decaying* animal and vegetable matter, such change being due to the presence of living organisms. Indeed, water with from 10 to 30 grains of dead vegetable matter, such as peat, per gallon, if free from *decomposing* matter, may be quite harmless.

Of all the sources of water-supply none is equal to that of a well-situated hill loch, and next to that a quickly flowing river; but, again, much depends upon the geological conditions, and each must stand pretty much on its own merits.

Analysis of Water.

At the present day we pay less heed to the mere chemical analysis than we did in olden times, and we pay greater attention to the biological examination, as being of much the greater importance in regard to the health of the consumer. In fact, one desirous of becoming a good analyst now requires to be specially trained as a biologist, especially in the bacteriological section, as well as a chemist. In days gone by all the biological knowledge we obtained from the chemist in his report upon a certain water was, that "the water contained organic impurities." Nowadays, by means of gelatine plate and other modes of cultivation of germs, the chemist, or biologist rather, is able to tell us whether or not the "organic impurities" are vitalised or not; and if they are vitalised, what name they go by—whether anthrax germs, typhoid fever germs, or what not.

Pollution of Water.

The pollution of water is a matter of paramount importance, the polluting matters being of such variety; and the means of getting rid of them, or rendering them innocuous, is either by means of filtration or of boiling. Now, the boiling of water for the consumption of the lower animals is hardly practicable, but the filtration of it is, and is a matter of so much importance that every stock-owner should interest himself to see that the animals do not get polluted water. I grant that there are many, many places in the country in which the supply of water is of the purest, and seems to be perfectly safe to use; but even in such cases it often happens that though no disease germs may be present in the water, yet the larvæ of worms may be, and when they gain access to the animal drinking of it, will give rise to grave outbreaks of disease—such as "hoose" in calves and lambs.

In farm places manure-heaps have much to answer for, as also have shallow wells in gardens—more particularly in gardens in which are privies and suchlike. The writer knows of a privy in the garden of a farm in Scotland which had, up to a recent date, not been cleaned out in the memory of man, and yet was in constant use, the natural conclusion being that the ordure percolated the soil beneath, and so tainted the water in the subsoil; and there is no doubt that the so-called *sporadic* outbreaks of contagious disease on that farm can now be accounted for, for it is certain that the privy must on occasions have been used by persons recovering from contagious disease. The writer knows of another case in which a dairyman grazed his cows on the land adjoining the sea-shore: it so happened

that the drainage of a village was carried out by pipes some distance over the sands in front of the grazing, and when high tides came the sewage was washed back over the grazing, and quantities of it were left high on the land. This continued to decompose; it polluted the grass and the water-holes; the cows became ill; some in calf aborted, and others had attacks of abdominal pain, dysentery, and died. Innumerable are such cases, and why? Simply because the notion has grown, and is firmly rooted in the minds of many, that any fluid is good enough for the lower animals to drink.

Take, for instance, the ordinary horse-ponds at farms; they are without doubt the finest incubators of germs that we have. Let them once become contaminated with disease-causing germs, and we need not wonder at frequent outbreaks of disease, varying in character and degree. For example, worms in horses are an extremely common thing. Sometimes these worms do little or no harm to their host; but, again, some varieties of these worms get into the walls of the bowels and cause death. It is well known that horses get most worms in drinking water which contains (and in fact is the natural habitat at one period) eggs or embryonic worms. Now this water may be a seemingly clean water, and we cannot see the minute parasites in it; but when horses do get wormy, then we may be pretty sure it is because they have been drinking contaminated water. Now if this water were even only roughly filtered, the eggs or embryonic worms would be kept back in the filter, with considerable profit to the horse-owner.

It must always be kept in mind that water may be contaminated at any time, and at any part of its course. For instance, water led in pipes may be contaminated by sewage breaking in through a faulty joint; or again, water from a supposed pure source may become contaminated before it enters the pipes, or running water may be fouled by animals higher up its course. The following instance, which occurred only recently, is of interest as regards lead contamination; it was as follows. The water-supply for a country house and farm premises was derived from a deep well some considerable distance away—a mile or two. This water passed through lead pipes from the well to a large cistern, and from there through lead pipes again to lead cisterns at the premises. Samples of the water had been analysed some years ago, and found to be of a very good soft water. The autumn following a very dry summer a number of the horses became unwell, and were found to have influenza; but instead of getting better after the disappearance of the acute symptoms of the disease, they "hung fire," and some of them became roarers, and others had heart affections. It was at the same time noticed that after each

feeding-time their teeth became blackened, or much discoloured. Now, it being known to professional men that roaring and discoloration of the teeth, with general unthriftiness, point suspiciously to lead-poisoning, it became necessary to ascertain the source of the lead; this was not difficult, as samples of the water taken from each pipe or cistern, from the main cistern to the stables, was found to contain lead in varying proportions. The inside of the pipes was partially eaten away, and was covered with lead compound. Now, how did this come about? It is known to chemists, firstly, that water free from organic impurities has little effect on lead pipes; secondly, that a not too hard water rapidly causes a coating of insoluble lead compound to form inside of pipes, preventing the water having any action on them; thirdly, that a very hard carbonated water first coats the inside of the pipe, and secondly dissolves that coating, and causes a dangerous proportion of lead to appear in the water; and finally, that water which contains any decaying vegetable or animal matter has a powerful solvent action on lead. In this case it was found that the cistern had been contaminated with decaying organic matter.

Importance of Pure Water.

I have thus pointed out in a general way how very important it is that the water-supply of the domesticated animals should be carefully looked after. Not long ago I met a gamekeeper who told me that it was his invariable practice to boil water, and then put it out for his young pheasants to drink. By this means he was sure he saved them from attacks of internal parasitic affections, and he was right. I have no hesitation in saying that the vast majority of worms found in the lower animals are partaken of in their embryonic condition in drinking water. Just take farm horses as an example. A great number of them are more or less affected with large white worms in their bowels, and each of these worms takes a considerable amount of food per day. It is extravagant and useless, to say the least of it, for the farmer to feed these worms, as they do no work; but more than that, they cause indigestion, "unthriftiness," colic, and even death. Then, again, take hoose or husk in cattle, sheep, or pigs. The thread-like parasites found in the lungs of these animals, and causing these diseases, are in all probability obtained either from the water drunk or from the water mixed with the food.

Another large class of diseases transmitted by means of water is that of contagious and infectious diseases due to minute organisms — "foot-and-mouth," rinderpest, glanders, influenza, and many others; and there is no doubt that if the germs of these diseases are added to impure water, their chances of growth are

much enhanced, whereas if they get into pure water they do not live long.

In conclusion, I would advise that all drinking-water, and water used for mixing with food-stuffs, be obtained either from a hill loch, a quickly running stream, a deep well, or from below a deep sand-and-gravel bed; that it be run through a sand filter before being stored in a slate or stone-built cistern, thus making certain that a considerable number of dangers to the health of the consumers be obviated.

SCAB IN SHEEP: SUGGESTIONS FOR ITS ERADICATION.

By Professor WALLACE, The University, Edinburgh.

ON 25th January 1899 the 'Times' published a letter by the present writer on the course to be followed for the eradication of sheep-scab in the United Kingdom. As many subsequent inquiries into existing circumstances fully confirm the views therein expressed, we now desire to amplify them with a view to emphasising the importance of a crusade against the scab pest, which, if systematically carried out, could not fail to end in complete success. The letter is as follows:—

The significant announcements made in the 'Times' of the 16th January [1899] that sheep-scab was twice as prevalent in 1898 as it was ten years previously; that the outbreaks were more numerous in 1898 than twenty years before; and that the six years in which outbreaks were most numerous are to be found in the last decade, clearly indicate that the orders of the Board of Agriculture, which were intended to deal with this greatest parasitic scourge of the flock-master, have proved to be totally inadequate for the purpose. This is the more to be deplored that the numerous futile restrictions and regulations, issued independently and disconnectedly by local authorities under these orders, have, by disorganising trade, created an immense amount of inconvenience and direct as well as indirect loss to sheep-owners. The Board is not to blame for trying the experiment of permitting local authorities to make the first attempt to master the scourge. Blame will only attach if it persists too long after failure has been demonstrated. The valuable lesson has been taught that nothing but a central authority is strong enough, consistent enough, and persistent enough to stamp out scab.

It is years since, by central action, the colonies of Australia and New Zealand banished scab from their flocks, and provided an object-lesson which we in this country may, in the light of our own legislative experience, follow with confidence, despite numerous admitted difficulties.

Cape Colony for political reasons adhered to the alternative method of local control, and the last published record shows that there scab continues to increase rather than diminish. The official corruption of the

Argentine Republic has hitherto made Government interference there undesirable, but it is believed that the newly appointed first Agriculture Minister of that Republic, Dr Emilio Frers, who takes office with an excellent record for wide experience and sound judgment, will ere long alter the situation in that country. The United States of America have also failed in their efforts by leaving the matter in the hands of the Legislatures of the separate States.

Owing to the great variety of local conditions and systems of management simultaneous dipping for the whole country is impracticable, but simultaneous dipping repeated at the end of twelve [or within fourteen] days (admittedly the most effective method of treatment) might be accomplished in different sections of the United Kingdom where scab exists, under the supervision of Government inspectors controlled directly by the Board of Agriculture. It is not to be denied that the difficulties to be overcome are genuine and numerous, more particularly in Wales, the main hotbed of the disease, and in the Highlands of Scotland, but none of them are insurmountable. Where sheep belonging to various owners run on extensive common lands, or where large flocks occupy wide, unfenced, and rugged areas of country, the task of bringing in every animal for treatment, which must be regarded as a *sine qua non*, will be the first and greatest stumbling-block. It is needless to refute one by one the numerous arguments which are locally opposed to a great and determined effort to exterminate scab in the British Isles. Suffice it to say that history is merely repeating itself. There is not an argument which the wit of man can now conceive that was not brought forward in Australia and New Zealand by interested parties, who wished to avoid the immediate trouble and expense of combined action. The overwhelming rejoinder to each and every protest, however feasible it may appear, is that the desired end was finally accomplished in New Zealand, where the mountains are higher and more inaccessible than those in this country, and moreover in some localities covered with bush and stocked with wild sheep which materially increase the difficulties.

The systematic dipping of sheep on the farm is only one phase of this important question. If possible a central authority is still more necessary to deal with "store" sheep travelling many miles by road or rail to market, or to distant grazings. The risks are imminent of clean animals picking up scab parasites, or of affected sheep contaminating clean flocks by the way. This, the most fruitful scource of infection, cannot be successfully controlled by local authorities acting independently. Another matter of vital importance is not sufficiently appreciated at present. Many of the numerous patent dips which are widely and successfully employed for certain purposes, as protection against flies in summer, are valueless when used as a cure for scab. Compounds of sulphur and arsenic, with tobacco juice added, are most effective.

The simple and inexpensive sulphur-lime dip, though its preparation for use requires more time and care than many of the patent dips, was the one most widely used in exterminating the scab parasite in Australia. A special quality of tobacco juice is its being so objectionable to the parasite that, while the smell remains on the sheep's wool, no fear need be entertained of reinfestation by mature *acari* left on a rubbing post or fence, where they can live for twelve to fifteen days after separation from the sheep.

It behoves flock-owners not only to make up their minds to endure the temporary inconvenience of, say, three years' close Government supervision of their dipping operations, but to strengthen the hands of the Board of Agriculture by making known that they fully appreciate that the great object in view cannot be attained but by central authority.

Gazette Returns.

The importance of the subject thus broached is shown by the following tables (I. and II.), which give the total outbreaks of sheep-scab in Great Britain during the past twenty years, and the monthly returns of outbreaks in England, Wales, and Scotland, as well as the aggregate total for Great Britain, since monthly returns were instituted by the Board of Agriculture in May 1897:—

I. OUTBREAKS OF SHEEP-SCAB IN GREAT BRITAIN, TWENTY YEARS, 1880-1899.

Year	Outbreaks.	Year.	Outbreaks.	Year.	Outbreaks.	Year	Outbreaks.
1880	1556	1885	1512	1890	1506	1895	3092
1881	2055	1886	1502	1891	2250	1896	3536
1882	2234	1887	1596	1892	2821	1897	2191
1883	1898	1888	1260	1893	2603	1898	2515
1884	1509	1889	1207	1894	2811	1899	2056

The variation in the total number of counties in England, Wales, and Scotland in which scab is known to exist, as published at intervals of one month in the 'London Gazette' by the Board of Agriculture, follows a similar course to that of the variation of monthly outbreaks, but the range between maximum and minimum is much less—viz., between 67 in February 1898 to 25 for September 1899. If the figures in the tables represent anything like the true state of matters, they are most instructive in showing how frequently the disease is carried from one county to another, and how futile local efforts are in dealing with it in the main channels of sheep traffic through which it is disseminated.

The improvement indicated by the figures for 1899, when compared with those for 1898, was due to the regulations having been more rigidly enforced, but the insignificance of the betterment only goes to confirm the hypothesis annunciated. Midwinter is the period when outbreaks are most numerous (after the time when sheep are most extensively moved from one district to another, and the infested flocks from the mountains brought down and spread broadcast over the country), and midsummer that in which they most nearly approach the vanishing point.

Preliminary Measures.

In the Annual Report issued by the Board of Agriculture of proceedings under the Diseases of Animals Acts, &c., for 1898, an attempt is made to excuse the Board for confining its actions to an effort to minimise, not to eradicate, the pest. The half-

II. Monthly Outbreaks of Sheep-scab in Great Britain between May 1897 and December 1899 inclusive, and total number of Counties in which Scab existed.

(*Taken from the 'London Gazette' monthly returns.*)

Month.	England.	Wales.	Scotland.	Great Britain.	Infected Counties.[1]
1897.	No.	No.	No.	No.	No.
May . . .	35	12	2	49	52
June . .	18	2	7	27	50
July . . .	11	1	3	15	39
August . .	13	2	1	16	29
September .	35	7	3	45	36
October . .	69	28	7	104	49
November .	143	71	19	233	59
December . .	256	185	13	454	63
1898.					
January . .	350	324	40	714	66
February . .	182	169	12	363	67
March . .	91	52	8	151	64
April . .	64	14	9	87	59
May . . .	34	6	6	46	50
June . .	32	7	2	41	48
July . . .	11	5	1	17	37
August . .	18	4	3	25	27
September .	26	5	3	34	28
October . .	67	72	4	143	41
November .	194	171	20	385	59
December . .	273	209	27	509	62
1899.					
January . .	319	182	36	537	63
February . .	165	208	22	395	59
March . .	93	91	11	195	57
April . .	57	38	14	109	58
May . . .	38	8	10	56	54
June . .	21	6	7	34	49
July . . .	11	4	5	20	43
August . .	6	0	2	8	33
September .	18	5	1	24	25
October . .	66	18	4	88	39
November .	129	110	17	256	52
December . .	200	121	13	334	56

[1] The 'Gazette' returns Lincoln as three, York as three, and Sussex as two counties, but in the figures in this table the counties named are recorded as one in each case.

hearted way the subject is introduced, and the absence of any practical reason for supposing that scab could not, with less difficulty and less cost than have been faced in Australia and New Zealand, be absolutely banished from our shores, appear to indicate that the Board is only waiting for an expedient opportunity to take action, or until outside pressure shall induce it to approach the matter with resolution. The preliminary step which made stamping out possible was taken when the Diseases of Animals Act, 1896, rendered imperative the slaughter at the port of landing of all foreign animals conveyed to this country, thereby relieving it of danger from without.

In a case where opposition, due to ignorance or personal interest, is a foregone conclusion, it is well to proceed cautiously; and probably the next important step towards the desired end should be to attempt to educate those who will be most involved by remedial measures in the nature of the affection and in the treatment necessary for its cure. In the Highlands of Scotland, which have always been a hotbed of scab infection, a marked improvement has been effected since the practice of smearing the flocks with tar and butter has been superseded by dipping in tanks, which is now the practice adopted in all parts of the country where stock-owners are enlightened enough to systematically combat the attacks of skin parasites. That dipping is not a universal practice is regrettable; and many of the numerous patent dips which farmers use without knowing what they contain are ineffective in destroying scab parasites. The idea is still pretty widely entertained that scab may develop spontaneously in a flock under certain conditions which are more or less hurtful to the health of sheep, such as a long railway journey, during which the animals are closely packed together and become heated.

Life-History of the Scab Parasite.

But scientific research has fully demonstrated that there is no such thing as spontaneous generation of life in connection with this or any other parasitic disease, and that common scab, otherwise termed "acariasis" and "itch," in sheep is solely due to the injurious action of the scab-mite, *Psoroptes communis*, Fürst, var. *ovis*. This parasite is confined to sheep, and lives upon those parts of the skin which grow wool. Head scab is produced by another distinct species of mite, *Sarcoptes scabiei*, de Geer, var. *ovis*, which lives on any part of the skin growing short hair, but most frequently on the head. Sinking more deeply into the skin, it more nearly than the common scab-mite resembles the species which attacks the common goat, and it is not so easily reached by external dressings or dips. It is with

the common scab-mite, the cause in this country of great pecuniary loss and much labour which might be rendered unnecessary, that we have now to deal.

The life-history of the parasite is simple; but an accurate knowledge of it is nevertheless all-important to those concerned, as upon this knowledge rests the chance of ordering aright the course of the treatment to be adopted. In the active forms it is easily destroyed by the poisons which effective dipping materials contain; but the eggs are, like the germs of so many low-life forms, practically indestructible by the ordinary means at the disposal of the farmer. It is therefore necessary to destroy all the moving *acari* by a preliminary dipping, and then, having waited until the eggs hatch out naturally, overwhelm the new brood by a second dipping before they are old enough to propagate their kind. If this work be perfectly done the cure is complete; but, as will transpire later, it is not all so simple as it at first appears. The mites live by biting the external surface of the skin, which becomes very much irritated and inflamed as a result of the action of the effective hooked and pointed mandibles with which nature has provided them. Pustules form and exude a serous fluid which dries into a crust or scab. This gradually extends and thickens as the colony becomes more numerous and the irritation and exudation greater. Under the edges of these scabs, which are firmly held in position by involving the bases of the wool fibres in their vicinity, the females find shelter and suitable repositories for their eggs. Each female when adult (fifteen days old) produces about fifteen eggs, which hatch in two or three days, some two-thirds of them developing into females. At first the young have only six legs, but the number ultimately increases to eight. The young migrate to fresh skin, and the affected area grows after the fashion of a fairy ring in pastures, the active part being that at the edge of the expanding area. At first the development is slow, and a flock may be slightly affected for weeks without much chance of the disease being discovered; but in two months or less the process of the increase in numbers proceeds at a rapid rate, and detection by the naked eye even at a distance becomes easy.

Such is a brief account of the common means by which the affection spreads on a single sheep. A scattering of the colonies takes place as the animal bites or rubs in the effort to relieve the excessive itchiness with which scab is associated. . This same effort is a fruitful means by which the parasite spreads from sheep to sheep. In the action of rubbing on earth-banks, walls, rocks, and rubbing-posts, a few scab-mites or their eggs are left on the "rub," to be transferred to the next sheep that come along to exercise the habit natural to them, although

they may not be affected with scab. Scab-mites do not propagate away from the skin of a living sheep, but under favourable conditions the mature forms have been known to exist for a period of twenty-one days on "rubs" and in dry earth or manure upon which sheep have been lying; and the eggs have been proved to retain their vitality for years in a dry and equable climate, and to hatch out on gaining access to a sheep. It is this wonderful vitality of the egg which has in a great measure led to the belief in the spontaneous-generation idea,[1] and which makes the stamping-out process difficult. But the chances of distribution by this means are enormously reduced when outbreaks are promptly dealt with and the sheep are not allowed at any period of the year to become badly affected. The mixing of clean and affected sheep, or their meeting on opposite sides of a wire fence, is the fruitful source of contamination when sheep suffering from scab travel on a public thoroughfare. Sheep in poor condition[2] or those suffering from constitutional weakness or bad management, yield to the insidious attacks of the parasite much more readily than robust animals in good condition, although all sheep suffer in the end when fully and freely exposed to contamination. Others again, such as Welsh mountain sheep, yield more readily to treatment than many of the Lowland breeds. These are not features peculiar to this country, as in South Africa scabbed sheep in the dry Karoo are well known to be more easily dealt with than those on the moist grassy lands near the coast, and long-wool sheep in the Argentine offer less difficulty in treatment than merinos.

Compulsory Dipping.

Before introducing the stringent regulations which will in the end be necessary to exterminate scab in its mountain fastnesses, the area of infestation might be contracted and the final work facilitated by a general order for the compulsory dipping during the season—1st June till 15th November—of all sheep on arrival from an open market or from a different district, with the additional proviso that sheep going from an infected area shall also be dipped before they leave. The practice would be nothing more than that followed where a good modern system of management prevails, and would be no hardship if self-support-

[1] Starlings and jackdaws which settle on the backs of sheep in search of the larger forms of ovine parasites are capable of transmitting scab from one flock to another located at considerable distances apart, and an extensive sheep-farmer has suggested to us that flies might also, as in other cases of infection, carry the parasites from one sheep to another and further complicate the question of the unexplained causes of outbreaks.

[2] Some authorities say especially when beginning to thrive.

ing public dippers were erected in those localities where the private means for dipping is found to be insufficient.

This preliminary step would in a thoroughly practical manner educate those who have been negligent of their own interests in respect of dipping, and who have, through ignorance, been a source of danger to their neighbours. It would also lead to the detection of the sources from which scab periodically emanates, and to the discovery and suppression at an early stage of what would, if unnoticed, develop into serious outbreaks, and into new centres of infestation. The partial success thus attempted might be made more easy and much friction prevented by a free circulation of leaflets by the Board of Agriculture, pointing out the main facts relating to the life-history of the scab *acarus*, the dangers of its distribution to clean stock, and, above all in importance, the effective dipping materials, together with a short account of the success which has attended their proper application. So long as a minority, and probably a considerable minority, of farmers believe that scab can appear in a flock spontaneously, and others are convinced that, originate how it may, it is impossible to completely destroy it, so long will there be opposition to any effective remedy. Opposition may also be expected from another class of individuals who, although not ignorant, are disinclined to undergo the trouble and expense of doing their share of the work necessary to complete its extermination. In this class will no doubt be found men making the excuse that they have had such intimate and prolonged experience of sheep-scab that it would be difficult to teach them anything new about it. But the fact that they have had ample opportunity to cope with it, and have not been able to do so, is the best possible evidence that their method of treatment is defective, and that they stand much in need of instruction.

Two or three years of preliminary management such as we describe would prepare the way for the final exertions necessary to complete the work of scab extinction in the United Kingdom, and the second stage of the scheme would begin with centres of infestation, reduced both in number and in danger to clean flocks. The country would require to be divided into areas or units of control, which would differ from each other in size and in internal conditions. Each area of similar character would necessarily be treated as nearly simultaneously as circumstances would permit, and be under the control of an inspector of the Board of Agriculture with a thorough experience in the management of sheep. It would be fatal to the scheme to appoint inspectors whose knowledge of sheep had subsequently to be gained. As owing to differences of local circumstances dipping would go on at different times within the

dipping season, one inspector with his staff of subordinates might control more than one divisional area, moving from one to another as the work proceeded.

Difficulties connected with Dipping.

Important considerations have to be taken into account in determining the proper season to dip. Sheep with a full-grown fleece of wool present a considerable degree of mechanical difficulty to the dipping material getting effectively to the skin. It is therefore best to dip after shearing, before the wool reaches its full growth. The cold of winter renders dipping dangerous unless the condition of the weather be carefully studied, a suitable time selected, and the work carried out early in the day. At low elevations, where sheep are confined in small numbers in fenced pastures, the obstacles which present themselves during summer and autumn are not serious and can easily be overcome; but in mountainous districts, such as are found in Wales and the Highlands of Scotland, where many farms are unfenced and where the sheep run in large numbers over wide areas, the task of handling sheep in an effective manner becomes a matter of undeniable importance, often surrounded with unmistakable difficulties. All available help is necessary for the gathering in of the flocks,—a preliminary necessity which is often rendered impossible by the foggy weather prevalent in these regions. Even under favourable circumstances a few sheep are usually missed, being concealed among rocks and other natural shelters—some even become cunning and hide themselves. The frequent driving in and handling of mountain sheep are also detrimental to their thriving, and in consequence the operation of dipping should as far as possible be done when they, in the ordinary course of treatment, require to be mustered for other purposes.

To this end an ideal time to dip would be in the first week of July, immediately after the sheep go from the shearers, when the dip material would thoroughly wet the skin and readily soak into the scabby protections of the colonies of *acari*. But the serious practical difficulty arises of lambs, which would require to go through the bath at the same time as the ewes, afterwards finding their mothers. The lamb at that early period is not always able to distinguish its mother by the eye without the wool; and in the case of both parent and offspring the odour of an effective dip destroys the natural distinctive smell by which sheep most readily recognise one another. It is estimated by competent authorities that, in the case of large flocks running in a wild upland country, probably one-third of the lambs would, after dipping, never find their mothers, and

at the early age at which the lambs would then be, weaning would be premature and calamitous. In the Highlands of Scotland considerable difficulty is already experienced in "mothering" the lambs after shearing, even without the complication of dipping.

Welsh Conditions and Difficulties.

A special case has come to our knowledge of the circumstances connected with a range of hills which borders on the Menai Straits. By following the details the reader will more fully realise some of the local difficulties which present themselves in mountain regions in Wales, where the flocks of sheep to be handled are large and the available force of competent hands to do the work is limited. On this area about 45,000 sheep are grazed. They belong to upwards of 300 different owners—a few having 2000 or more, several between 1000 and 2000, some dozens from 600 to 800, and the remainder from 5 or 6 sheep up to as many hundreds. As there are no subdivision fences for eight to ten miles in one direction and ten to twelve in another, the different "hefts" of sheep are free to mix with each other. It is true that sheep do not usually travel far from the spot where they have been bred and reared, but nevertheless the whole 45,000 are in contact, and are capable of passing on scab-infestation from one to another. In some parishes every householder has a right to pasturage on the hill, without any restriction as to numbers; in others, only occupiers of land are allowed the privilege: while in the case of a few, the number is restricted to one sheep per acre of low land held; in another, to a sheep and a half for every pound of rent paid: while on one manor within the area, any person paying one shilling per sheep can turn out stock. There exists great complication in the matter of ear-marks, single owners possessing as many as six distinguishing marks. "The sheep are drawn off the hills as clean as possible for shearing in the month of June, and they are driven to the farms and villages north, south, east, and west. Those on the eastern slope are drawn first. This year, 1899, according to custom, they were taken down during the week ending Saturday, 17th June, at 12 A.M. At 12.30 A.M. on 19th June the shepherds and small owners started to bring in the sheep on the north-western slopes, and the following week the flocks on the south, west, and south-east slopes were drawn down."

The practice is to wash the sheep brought in each day and herd them on the sea-shore and in by-roads, and to shear them when dry two days later. As all enclosed grass-lands are either fully stocked with cattle or ewes and lambs or reserved for hay, it would be impossible to keep the mountain sheep for a

longer period. All available men are employed either shearing or attending to the flocks, and every effort is made to get the sheep returned to their pastures without unnecessary delay, after being pitch-marked and raddled. The small owners are careless about going up to the hills to assist in the work of gathering even at shearing-time, trusting to the shepherds and neighbours to bring their little flocks down. But if the small owner be not on good terms with some of the gatherers, the chances are that a sheep belonging to an unpopular man, attempting to get away, will be permitted to go, and thus to retain its fleece till the owner goes at his convenience to shear it where he finds it. To gather the sheep on one of the areas worked separately requires over thirty men—each with two dogs—and hearty co-operation in the work. And after every ordinary effort has been made, a few sheep may be left behind, hidden in some obscure corner. Some sheep so cunningly avoid mustering that they have been got, months after the shearing season, with two fleeces on their backs. The sheep are first taken to folds on the open mountain, and there separated into private pens in owners' lots; and subsequently they are driven to the homesteads to be shorn. When sheep are missed, as is inevitable in foggy weather, they are frequently left on the hill till the end of September, when the flock is again brought in for other purposes.

After shearing, the men are immediately required for the hay harvest—a matter of great importance in Wales. Even if the difficulty of mothering the lambs after dipping could be overcome at shearing-time, there would remain the inconvenience of overtaking the additional labour of a second dipping within fourteen days. The hay crop would thereby be belated in a climate which is more humid and treacherous than in the less mountainous counties of our east coast, and this would interfere with the corn harvest, which immediately follows the ingathering of the hay. Other drawbacks to the dipping of large flocks immediately after shearing are the facts that bare sheep, which are difficult to hold, are liable to receive much rougher treatment at the hands of the shepherds, and in their unprotected state they easily injure themselves by rushing against the walls of the folds and while passing through gateways.

The most convenient time to accomplish two dippings in such hilly districts as have been referred to would be in the end of September and beginning of October. During the last week of September the "cast" ewes and wethers go to market, and the whole stock require to be brought in to permit the selecting and "drawing" to take place. Again the lambs go to "tack" (to winter quarters in the low ground) about 8th

October, and the sheep are marked with raddle at the same time. The second dipping could be conveniently done at this muster with little additional trouble, and the few stragglers which had escaped observation in the end of September, and thereby missed the first dipping, could easily be retained and get a second dipping—say, four days later—before being allowed to go back to the hills. If the old-fashioned and quite unnecessary custom of sheep-washing before shearing, which strains and injures the animals as much as any other operation of handling, were discontinued, even a third dipping might be undertaken when required without seriously adding to the total amount of manual interference during the course of any one season. The rams go to the hills on 1st November; but a third dipping, in the cases where this would be needed, could be accomplished, and the requisite ten clear days after dipping the ewes be permitted to elapse before the rams came among them.

In the unfenced mountain areas, which will present the greatest difficulties, it would be necessary to colour differently the first and second dippings—one with ochre and the other with Spanish brown or Indian red—so that the few sheep which were missed and left on the hills might be readily distinguished and forthwith brought in for treatment and isolation. The unfenced condition of extensive areas in Wales is no doubt largely responsible for the existence of so much scab in the country and for the difficulty of contending with it. The want of fences and the lack of improvement in systems of management is in a great measure due to the defective unwritten titles under which the people hold the land—a condition of things which may call for legislative action as one of the preliminary means by which scab is to be got rid of. The Crown, through the Department of Woods and Forests, claims to be lord of the manor, and to possess proprietory rights in the minerals and in the winged game, with power to charge rent for fences erected on the land, and also to veto their erection at discretion. In one instance which came to our personal knowledge the annual rent arranged on a mountain fence of seven miles in length was £16, 10s. The residents are acknowledged to possess grazing rights on the unfenced lands through virtue of long hereditary occupation; but there their proprietory rights terminate, and should the owner of an enclosed area allow the fence to go down, the land lapses to the Crown as waste land, and he is not permitted to rebuild the fence or to reoccupy this derelict holding.

Objections to Local Restrictions.

There are serious objections to the present method of restricting the movements of sheep in the United Kingdom. The

restrictions imposed by the local authorities of one county interfere with the freedom of action of stock-owners in other counties, who have no say in the matter. Thus it cannot be claimed for the system that the people, through their representatives, have the privilege of making laws for themselves, or regulations implying that united action which alone can lead to the stamping out of scab. Sheep are frequently reared in one county, marketed in a second, and fed in a third. Moreover, farmers find it practically impossible to learn what all the local county regulations are, and they are consequently liable to break them and unwittingly incur the penalties attached.

While all this vexatious interference is going on, leading to little, if any, improvement, the owner with clean stock suffers equal inconvenience with the others. Sheep are marketed at a disadvantage, which means, in plain language, that sheep are frequently sold at less money than they would have brought had the existing scab regulations not been in force. Such a state of matters permitted to continue apparently indefinitely is discouraging to stock-breeding, and is not to be defended from the point of view of the responsibility of the Legislature. Above and beyond the irksomeness and loss from prolonged ineffective restriction, there is the initial loss and annual special outlays due to the existence of scab in the country. From the following figures, relating to a country which possesses a total of about 18,000,000 sheep and goats, some idea may be gained, not only of the magnitude of the question at issue, but also of the proportion which may exist between the annual loss from scab and the cost of its extermination, although it must be remembered that in this country the disease does not prevail to anything like the extent that it has reached in South Africa. It is estimated that the annual loss from scab in Cape Colony is one million pounds sterling. In 1893 Messrs Wm. Cooper & Nephews made an offer to the Colonial Government to eradicate the disease within three years for a maximum sum of £735,000, or per annum less than a quarter of the annual loss. No man of business with such guarantees of success as were offered would refuse such a bargain, but in this case the transaction fell through owing to political exigencies, and the Colony continues to bear its burden in patience, as forsooth the British farmers have likewise to do!

Central Control and Dipping Accommodation.

In the new order of things which we desiderate, the supreme authority ought to rest with the Board of Agriculture; but there exist certain local details which the Board might advantageously delegate to county councils to carry out. In this

connection the provision of dipping accommodation might be mentioned as of first importance, chiefly in the interest of crofters and small farmers and others who do not possess the necessary appliances for dipping, in view of the fact that compulsory regulations would press most heavily upon those classes who are least able to bear the burden. Dipping may be regarded as a *sine qua non*. Except as an adjunct to dipping, "hand-curing" or "hand-dressing" of sheep, especially in large numbers, in place of being a remedy is a fruitful means of spreading the disease, as the sheep require to be penned while the work is being done; and those which have not been formerly affected are sure to contract it by coming in contact with sheep suffering from scab. A dipper is a necessary adjunct to the furnishings of a large sheep-farm, but the cost of erection makes it prohibitive for small sheep-owners to possess one, and compulsion under a borrowing system is out of the question.

To guard against the hardship which compulsory dipping would impose upon small farmers and upon dealers, and for the convenience of all other owners of sheep whose flocks travel by rail or road, the Board, as a first step to secure the carrying out of a compulsory dipping order, should impose upon county councils the duty of providing concrete public dippers at convenient centres where occasion demands, or travelling dippers in the few localities where economy may make them preferable. At all auction marts where sheep are sold a dipping-tank is as essential in the public interest as a weighing machine, and should be provided and controlled by the market authority. It is not proposed to impose a new burden on the rates, as the charge for dipping should be fixed so as to cover the cost of dipping material and yearly upkeep, and to provide a sinking fund to recoup the initial capital outlay. Such an excessive premium is paid for many patent dips, for the convenience of getting the material in an easily manipulated form, that where dipping is done on a large scale and with appliances for preparing and mixing the ingredients on the spot, the cost per sheep can often be very considerably reduced below current rates. While it might at first be considered a drastic interference with the liberty of the subject to prohibit the use in a farmer's private dipping-tank of any of the many unreliable dips that are in the market, if he in his ignorance be satisfied, there could be no serious objection to the Board of Agriculture, through the county councils, specifying the strength and quality of the dips to be used in all public tanks. Public tanks would then become centres of instruction in the quality of dipping materials, and they would be equally educative in the methods of application. The average total cost of erecting a dipper, in all but the large centres where extensive accommodation will be required for handling large numbers of

sheep in a short time, need not exceed £50—exclusive of the appliances necessary for boiling the dipping-stuffs. This estimate covers the formation of a concrete dipping-trough and dripping-floor, and the erection of substantial post-and-rail fences to form folds large enough to hold the sheep going into and after passing through the tank. Farmers who undertake the carriage of materials at convenient seasons, and direct the work of construction personally, may erect concrete dippers for their own use at an average outlay of about £30.

Dip Materials.

The poisons present in all the common effective dips resolve themselves into a limited number of well-known chemical substances which, in wholesale quantities, can be procured at very moderate prices. They are essentially four—arsenic, sulphur, decoctions of tobacco, and carbolic acid. For 100 sheep 10 lb. of hellebore (boiled for an hour) and stavesacre are sometimes used with excellent results as supplementary ingredients; and corrosive sublimate (perchloride of mercury) is recommended by Finlay Dun[1] as a cure for scab. This last, however, is so much more dangerous to the animals than arsenic that it is rarely resorted to.

A dip made with white arsenic (rendered soluble by boiling in 2·5 gallons of water 45 lb. of arsenic with 45 lb. of carbonate of soda crystals, to form the arsenite of soda,[2] without leaving any free alkali) is immediately effective in destroying the mature *acari* of scab, although it is harmless against the young forms, which hatch out from the uninjured eggs in a few days after dipping. It is not dangerous to the sheep if used in moderate quantities—say 2 lb. to 100 gallons of water. A case is recorded of sheep losing their teats after being dipped in a solution of double this strength. It is best for the farmer to purchase arsenic in solution, which can be got at two shillings per gallon, each gallon containing 5 lb. of arsenic. Cold water is then added to the concentrated liquid to bring the solution to the standard strength.

Sulphur is commonly used in this country in the insoluble form of the flowers of sulphur, and it merely mixes with the other dip materials. It adheres to the wool and exercises a prolonged influence—the effluvium evolved keeping off maggot-flies during summer. Whether administered internally or applied externally, it is extremely searching in its action, and its presence is inimical to the development of most of the common forms of ovine parasites. Its chief drawback is the

[1] Veterinary Medicines, 8th ed., 1892.

[2] Cold water is then added to bring the amount up to 9 gals. of a standard solution containing about 5 lb. arsenic per gallon.

difficulty of mixing it in the dip so that each sheep receives a proper proportion. This is partially overcome by associating with it an equal weight or more of black (soft) soap, which also aids in dissolving arsenic. In Australia, where sulphur has been so effective in the extermination of scab, and in America and South Africa, where it has been used with excellent results, it is dissolved in combination with lime—25 lb. of sulphur and 18 lb. of slaked lime being made into the consistency of thick cream, and then boiled for twenty minutes in 20 gallons of water, when the sulphide and hyposulphite of calcium form. The resulting orange-coloured liquid is finally mixed with sufficient cold water to make it up to 100 gallons. The only drawback to this dip is the difficulty of preparing it in sufficient quantity to dip large numbers of sheep—say 25,000 to 100,000—in a short space of time.

Tobacco is the most valuable of the effective dip materials for which may fairly be claimed the property of being non-poisonous to sheep. Although not so immediate in its action in killing living parasites as arsenic or carbolic, it is so distasteful to them that it is the best of all the dipping materials used for preventing living *acari* from gaining access to the fleece, and there re-establishing themselves, from "rubs" or from the ground on which scabbed sheep have been resting. The existing Customs restrictions on the importation of certain useful forms of tobacco for dipping purposes are so unnecessary and so troublesome, that the matter requires reconsideration. Before leaf-tobacco for dipping purposes can be manufactured in a bonded warehouse under, practically, almost impossible conditions, it has to be mixed with impurities which render it unsuitable for other uses,—for every 100 lb. of dry leaf-tobacco, 10 lb. of blue vitriol, 15 lb. of common salt, and 2 lb. of oil of turpentine. Ground tobacco, which can be bought in America at very moderate prices, is not admitted into this country—a grievance of which farmers have just cause to complain. The quality of the manufactured products of tobacco, in the form of paste and juice, is not to be always relied upon.

Carbolic acid[1] is highly effective in killing living parasites on

[1] For the benefit of the ordinary reader we have retained the familiar and industrially more common name carbolic acid (phenol), although the cheaper and for the purpose more suitable, nearly allied phenolic substance cresol or cresylic acid (95 to 97 per cent purity) is preferred to crude carbolic acid by the best so-called non-poisonous (carbolic) dip-makers. Cresol is liquid at ordinary temperatures while carbolic acid is solid, although more soluble in cold water in the proportion of 11 to 29. Cresol is generally considered to be superior to carbolic acid as an antiseptic and vermin-killer, and Allen speaks of it as on the whole less irritating to the skin, especially after the separation of an acrid phenoloid body of high boiling point.

For details see 'Coal-Tar and Ammonia' by Professor Lunge, published by Gurney & Jackson, London; and a paper by Alfred W. Allen in 'The Journal of the Society of Chemical Industry,' vol. ix., 1890.

sheep; but if used strong enough to destroy the eggs of the scab-mites by coagulating the albumen in their substance, it is liable to irritate the skins of the sheep, and give such a shock to their nervous systems that the function of digestion is suspended, and the animals become hoven, as in tympanitis, and a speedy death can only be prevented by immediate washing in clean water. But when used in moderate quantities—viz., 1 gallon to 50 or 100 gallons of water—the mixture is so safe that it has been designated by the trade "non-poisonous" dip. Only cresylic acid of 95 per cent to 97 per cent purity is quite free from the risk of staining the fleeces of white-woolled sheep, as the lower grades contain pitch-oil, and are so irregular in strength that uniformity of results are difficult to obtain. But from the best manufacturers of "carbolic" sheep-dip this ingredient of a mixed dip can be purchased in 40-gallon casks at the reasonable price of 2s. 6d. per gallon, of such a strength that 1 gallon of the material is sufficient for 100 gallons of water. The ordinary farmer could not save much by preparing the carbolic acid at home. In conjunction with arsenic its effects are most satisfactory. It is not good practice to use a strong carbolic dip twice within fourteen days, as lambs especially are liable to swell in the limbs as if foundered; but a carbolic dip may precede or follow an arsenic or other dip within that space of time with safety and with excellent results.

Pitch-oil we do not recommend for general use, owing to the objections which wool-manufacturers have to its injurious effects, when not properly handled, on the colour and dyeing properties of the wool, although 1½ gallon to 80 gallons[1] of water makes a most inexpensive and effective dip for 100 blackfaced mountain sheep if used in October. Pitch-oil is a product of very irregular composition, got by fractional distillation of tar from blast-furnaces or gas-works. It is also known in the oil trade as lusuline, torch-oil, and black naphtha, and the valuable property which it possesses is mainly derived from cresol. The lower grades of pitch-oil should not be used for dipping purposes under any circumstances. Even the purest samples which come clear from the still, worth at present about 4d. per gallon wholesale, darken on being kept a couple of months, although no sediment settles. The naphthalene which it contains is largely accountable for the discoloration, and it is believed to exercise an injurious influence upon the wool when the oil is not thoroughly saponified, by mixing with from 3 to 6 lb. of black soap per gallon. This risk is minimised, if not wholly removed, if the oil and soap be mixed a few months before use, so that no crystallisation can take place, if the bath be kept at

[1] Small sheep down to 60 gallons per 100.

a temperature of not less than 60°, but, still better, 70° or 80° F., if the deposit from oil that has been exposed to frosty weather be removed before use, the dip ingredients carefully mixed, and the contents of the bath repeatedly and thoroughly stirred. Pitch-oil is of no value as a preventive of fly-blowing. The increase of the prices of burning oils and of carbolic acid which are made from coal-tar may check the use of pitch-oil as a dipping material.[1]

A stronger solution of any one of the above-named poisonous substances would destroy the living external parasites which infest sheep, but at the risk of injury to the sheep. The desired result can be effectually secured without danger to the animals by the use of dips made up of combinations of two or more of these substances in the safe proportions which we have stated. The immediate action of arsenic and of carbolic dips can be fortified by the addition of sulphur or tobacco. Either addition also prolongs the action of a dip, and thereby materially adds to its ultimate efficiency. Considerable variety can thus be imparted to the means at the disposal of those to be intrusted with the eradication of scab, so as to enable them to select the combinations necessary to combat the special difficulties which present themselves in different districts. While tobacco, which adds materially to the cost of a dip mixture, will be absolutely indispensable in Wales, where there is the danger of a few undipped sheep mixing with those which have been dipped, it may be left out in those parts of the country where the sheep are so fully under control that they can be confined after dipping within enclosures where chances of contamination would be impossible. The amount of dip material necessary in autumn for 100 sheep may be stated in round figures at 80 gallons for mountain breeds and 100 gallons for the larger lowland sheep, smaller amounts being sufficient in both instances for recently shorn sheep and for lambs.

Practice of Dipping.

Much has been said of the necessity of keeping sheep immersed for at least a minute in the dip; but if it be of the proper strength all that is needed is that the sheep's skin should be thoroughly wetted. If a long swimming-bath of 21 feet, more or less according to circumstances, be employed, the work as a rule can be efficiently done in much

[1] Indebtedness is fully acknowledged to Mr Alexander Robertson, Oban, Mr Robert Carruthers, Dumfries, and Mr John M'Kerlie, Thornhill, for information relating to trade considerations connected with the chemical materials used in the making of sheep-dips.

less time.[1] Messrs Lawrie & Symington, at their auction mart at Lanark, dip 600 full-grown hill sheep per hour, or a greater number of lambs, in a trough of this length. When a sheep is dropped in head foremost at the deep end of the tank, the wool naturally opens and admits the dip solution, and as the animal struggles to swim, after getting merely its head above water, every part of the surface of its body and head cannot fail to be soaked before it finds its way out. An exception must be made in the case of sheep badly affected with solid lumps of scab, which are often difficult of penetration. More time for the absorption of the liquid is then necessary, but its action is accelerated and rendered more complete when the bath is kept at a temperature of 100° F. It is also good practice in aggravated cases to draw off the worst affected animals, break the scabs by hand, and "pour" with a strong solution of the dip material; but such treatment may fairly be regarded as the exception and not the necessary practice in the majority of the infested flocks. With dips of regulation strength there is practically no danger of sheep swallowing the poison when put in as suggested, as they see what is before them and involuntarily close both mouth and eyes as they make the plunge. The danger of poisoning occurs when a sheep is awkwardly forced in back down. Owing to the shock to the nerves from going suddenly into cold water, and to the natural fear of the uncertainty of what is about to happen in the unnatural position in which it is held, a sheep is liable to open its mouth, and if the head go under by accident, to take a gulp of the poisonous liquid.

Summary of Regulations.

Following is a brief summary of the regulations which we believe will be required in the final supreme effort to eradicate scab after an order for compulsory dipping has done its preliminary work.

1. A dipping season to be fixed between the 1st of June and the middle of November.

2. After local inquiry the county to be subdivided into convenient areas, the conditions of which make it desirable that the flocks in each should be systematically dipped within a period of fifteen days, which might be regarded as sufficient control in all districts believed to be free from scab.

3. Where scab exists within an area a second dipping to be made compulsory between the fifth and the fourteenth day after the first dipping of any given flock of sheep.

4. That inspectors be appointed by the Board of Agriculture

[1] On a farm, under ordinary circumstances, 1000 sheep is a satisfactory number to pass through a dipper on a short October day.

who have a thorough practical knowledge of the management of sheep. Each inspector to control the working of one or more areas under general regulations formulated by the Board of Agriculture, but with sufficient elasticity to enable them to be made applicable to local conditions.

5. No sheep to be removed from one area to another during the dipping season of five and a half months without being first dipped immediately before removal—once in the case of clean areas, and twice in the case of areas in which scab exists.

6. Flocks which have travelled or have been to market to be dipped not later than the seventh day after being imported into an area and before coming into contact with other sheep.

7. All railway trucks and pens in public markets and other places in which sheep are placed to be thoroughly disinfected—first, say, with carbolised water or a solution of corrosive sublimate, and afterwards with fresh lime whitewash.

8. Due notice to the inspector to be given in the case of infested farms of the dip material to be used and of the date and place of dipping of the sheep to be removed, so that if he consider it necessary he may send a sub-inspector to supervise.

9. Effective dip material to be used; and where close inspection and control are necessary, the first dip to be coloured with Venetian red or Spanish brown, and the second dip with ochre.

10. The county council to be authorised and directed to provide dipping-tanks, the total cost to be met by those who use them.

Concluding Summary.

Although the proposals which we make would necessarily involve organisation expenses, yet they should not add materially to the dipping bill of the country. All sheep-owners who are alive to their own interests dip their flocks once, and in some cases twice and even three times, a-year; and probably 990 sheep of every 1000 are annually passed through the dipping-tank. The chief object of late autumn dipping, which is the most general and most thorough of all, is to destroy the six-legged louse-fly or sheep-tick (kade, Scotch), *Melophagus ovinus.* Farmers in certain districts, as in Perthshire, have successfully exterminated it among their own sheep by giving two dippings, with an interval of seventeen to twenty-one days between—the eggs or puparia not destroyed by the first dipping developing into adult forms which the second dipping kills. The complete extermination of this troublesome pest is another desirable object to be gained by systematic dipping to cure scab.

Spring dipping is usually only practised when for one of the various causes of failure the autumn dipping has not proved successful, except when an attempt is made to ward off

grass-ticks, *Ixodes*, and thereby to prevent the appearance of trembling or louping-ill. Summer dipping is necessary to protect sheep from the attacks of maggot-flies, but many of the special dips used for this purpose, although probably almost as costly as a thoroughly efficient general dip, do not destroy scab-mites. It is also a common practice to run lambs through the dipper a few days before going to sale, but mainly with the object of improving their appearance in the market.

Dipping is in reality an all but universal practice in the country, carried on at great expense with only limited success. The great objects of this paper are: (*a*) to compel the owners of the small percentage of undipped sheep to fall into line with their more enlightened neighbours; (*b*) to provide facilities for dipping, through the medium of public dippers, for those who have not the means in their possession; (*c*) to secure the general employment of effective dips; and (*d*) to organise, under central authority, the work now being done, so that sheep-scab may in a few years be exterminated, and thereby the flock-masters freed from the grievous losses which result from the irritating, ineffective restrictions under which the flock industry at present labours.

CANADIAN EXPERIMENTS IN ANIMAL GROWTH AND DAIRY PRODUCE.

By William Brown, formerly Professor of Agriculture, Ontario Agricultural College, Guelph, Ontario.

When an old land, such as Britain, looks back to its agricultural youth, with its aspirations, occasional troubles, much progress, and even its fevers of experimental research, she should not grudge allowing a place, in the calm of her maturity, to listen to the story of what one of her children has been doing through similar experiences, within a much shorter period.

Canada has just had its preliminary canter over agricultural experimentation—actually one quarter of a century—and I would therefore like to tell the world, concisely, through this publication, what has been done there in this aspiring and rather dangerous road to farm honour and national teaching.

I will have to confine myself at this time to the most interesting field of Animal Growth and Dairy Produce. Even with this limit my difficulty may be to show all that has been done thus much, so as to catch the eye and the interest of our people —there is so much of it.

Besides the older Ontario experimental station at Guelph, those of the Dominion proper include Ottawa, in Ontario; Nappan, in Nova Scotia; Brandon, in Manitoba; Indian Head, in Assiniboia; and Agassiz, in British Columbia.

That of Ontario was begun in 1876, those of Ottawa, as a centre for the Dominion, opened in 1890, and all are still in bright progress. This immense range of area and conditions, already in the hands of scientific light, shows how much the people of Canada are intent in developing the land intrusted to them—in direct practical evidence, therefore, that they are not afraid to illustrate what they hold, and offer, for the purpose of making homes and independence of what remains for thousands of others.

Cattle-Fattening.

Up to date at Ottawa the following distinct forms of rations have been handled for experimental cattle feeding and fattening:—

1. Maize ensilage, with hay, straw, roots, and grain.
2. Hay, with straw, roots, and grain.
3. Maize ensilage, with straw and grain.
4. Maize ensilage and straw.
5. Robertson's ensilage and straw.

It is necessary to note that hay in Canada means practically the one plant called timothy, or cat's-tail; that "roots" included mangolds, swede turnips, and carrots; straw being oat and wheat straw, and grain a mixture as specified; the Robertson's ensilage was a mixture of hay, roots, maize, horse-beans, and sunflower-heads.

The main objects of the experiments being to obtain information on the comparative cost of fattening store steers with these rations, a cash value was estimated for the component fodders in each, thus:—

	Per ton		
Maize ensilage	£0	8	0
Robertson's ensilage	0	10	0
Hay . .	1	12	0
Roots . .	0	16	0
Straw . .	0	16	0
Grain—equal parts by weight of pease, barley, wheat, oil cake, and bran	5	0	0
Grain—equal of pease, barley, and wheat . .	5	0	0
Frosted wheat	2	10	0
Oilcake and cotton-seed-meal . . .	7	0	0

It is unnecessary to specify the minutia of feeding during a succession of Canadian winters,—enough that every exactness and system were followed, and the results carefully recorded; let us gather up the present conclusions arrived at, graphically

as our space demands, and in a form best calculated to invite the attention of our readers—pert striking statements having power to draw thought, and maybe even rouse others to action.

1. At Ottawa in 1890-91 two lots of two-year-old shorthorn grade stores, six head each, were handled. On entry they weighed an average of 1024 lb. and 997 lb. per head respectively.

2. During a period of twenty weeks those fed upon a daily ration of 50 lb. maize ensilage and straw, with $4\frac{1}{5}$ lb. meal, gained in live-weight 33 lb. per head more than those fed upon 44 lb. hay, roots, and straw, with $4\frac{4}{10}$ lb. of meal.

3. This ensilage ration cost nearly 4d. less per head daily than did the other.

4. The same ration gained $61\frac{1}{2}$ lb. per head more, and cost nearly 2d. less per day, than a ration of hay, roots, maize ensilage, and straw with meal.

5. The animals fed on the gaining ration were also in the most attractive condition for sale.

6. In 1891-92, over a period of eighteen weeks, the cattle fed on maize ensilage and its additions gained $55\frac{1}{2}$ lb. more per head, and cost nearly 2d. less per day, than did those upon the hay and root ration previously noted.

7. They also gained 36 lb. more, and cost almost 2d. per head less, than those fed as named in paragraph 4.

8. The cost of food per 100 lb. of increase in live-weight was 63 per cent greater on ration given in latter part of paragraph 2, and $48\frac{1}{3}$ per cent greater on ration in paragraph 4, than did the animals on the gaining ration.

9. In 1892-93 it appears that over a feeding period of twenty-four weeks the stores that were fed on the previously gaining ration gained 19 lb. per head more, and cost $2\frac{1}{2}$d. less per day, than those fed upon 44 lb. hay, roots, and straw, and $4\frac{4}{10}$ lb. meal.

10. The cost for food consumed per 100 lb. of increase in live-weight was $66\frac{1}{3}$ per cent greater on ration last named than it was on 50 lb. maize ensilage and straw with $4\frac{4}{10}$ lb. meal.

11. Thus over these three-year periods at Ottawa we find that the ration of maize ensilage, straw, and meal gained in weight on the average 36 lb. per head more, and cost nearly 3d. less per head for food consumed daily, than the best of all the others.

12. Tabulated, the average of the results stands thus:—

	Hay, roots, and straw. lb.	Maize ensilage and straw. lb.
Entering weight	1024	997
Closing weight	1201	1225
Increase per head daily	1·05	1·35
Cost per head daily	7d.	$4\frac{3}{8}$d.
Cost per 100 lb. increase	£2 17 6	£1 8 4

As a second inquiry into this important subject, we are introduced to two other rations, abstractly—maize ensilage and straw, and Robertson's ensilage and straw—as the bulky portion of each.

Eight steers of no special type were handled, the object being to ascertain the feeding value of a new ensilage mixture made up by Professor Robertson, the Commissioner of Agriculture and Dairying for the Dominion. That special ensilage consisted of maize, horse-beans, and heads of sunflower, and has been thus computed in nutritive value per acre:—

	Albuminoids lb	Carbohydrates lb	Fats lb
Maize	873	7371	280
Beans .	653	1814	167
Sunflower	352	2373	729

The mixture should contain about 10 tons of maize fodder to 3 tons of beans and $1\frac{1}{2}$ ton of sunflower-heads.

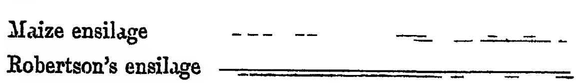
The feeding tests were begun in 1893-94, and during eighteen weeks each animal of each group got—

	lb
Robertson's ensilage . . .	50
Straw	5
Grain, pease, barley, and wheat ground	$1\frac{2}{3}$
Maize ensilage . . .	50
Straw	5
Grain, as above . . .	$5\frac{1}{2}$

In this contest the animals on Robertson's ensilage, with the small allowance of $1\frac{2}{3}$ lb. of meal per head as against $5\frac{1}{2}$ lb. for the other group, did not show a satisfactory gain; then occurred several changes of animal groups and of meal allowances for the purpose of making tests for the final trial, which was:—

	Robertson's ensilage lb	Maize ensilage. lb
Fodder . .	58	59
Meal . .	2	$5\frac{1}{2}$
Increase .	1·47	·95
Cost . .	6d.	$7\frac{1}{2}$d.
Per 100 lb. increase	£1 12	£3 8 0

But for the whole period of twenty-four weeks' testing, the relative *cost* of production under this inquiry may be thus illustrated:—



That is, that for every 100 lb. of increase to live-weight the

percentage was 27·1 greater in cost with the ordinary ensilage than it was with the special ensilage mixture.

Some other cattle-feeding experiments have been undertaken at others of the Dominion experimental farms, especially Brandon, but they have not as yet been brought to a conclusion.

So far, then, Ottawa cattle-feeding experiments have shown several important conclusions that deserve a line of recapitulation.

Maize, the great fodder plant of that continent, is the basis of farm life and progress—in quantity per acre, grain production, bulk of leaves and stalk for animal use, perpetual succulence, corn issue, ensilage stand-by, milk-maker, and beef-producer. In this Ottawa testing it had to be used to help to outdo itself by embedding horse-beans and the heads of sunflowers as a special condimental food to bring young cattle into rapid and cheap beef. Maize, as an ensilage by itself, beat other green-dry fodders considerably faster and cheaper, so that Canada has unquestionably to bow to maize in her rural economy.

Guelph Cattle-Fattening.

It is safe to say that Guelph experimental station has undertaken too much, even for its quarter of a century—too many subjects and not enough repetition of them; but it has done several very well—it has been strong in live stock and several cropping issues.

I am obliged to go backwards on the order of experiments reported, because of want of access to primary ones meantime; this will do no harm.

The most recent cattle-testing of sufficient importance comes to 1892, when a two-years' competition was closed between grades of Galloway, Shorthorn, Aberdeen Poll, Hereford, Devon, and Holstein, as also a "scrub" or native of the country. The primary objects were to ascertain (1) the cost of rearing grade steers for beef from birth to early maturity; (2) comparative cost of them on whole-milk and on skim-milk; and (3) the comparative cost of beef from native stock—all being started as calves on milk, averaging two weeks old. The whole story of this wide field is too extensive for me here, so that only the closing conclusions can be noted.

1. In rearing on a forcing ration during the first year, the effect on the second year's progress is not satisfactory either as regards general animal welldoing or financially.

2. That there is a marked difference in the constitutional ability of animals to bear a forcing ration—the Galloway grade made the highest daily gains during the second year.

3. In rearing for beef with a forcing ration for two years, the

meat is made at a loss, which in this example with the eight animals amounted to £15, including the value of manure. The plan of valuation seems, in this figuring, to be irregular, and altogether the subject deserves repetition.

An unusual experiment was but touched upon in 1888, to ascertain the value to cattle of some of those forms of meal not usually regarded as applicable to lower animal life, because possibly of their greater value for man himself. The example took place with six head, having Shorthorn, Hereford, Aberdeen Poll, and Holstein blood in their breeding; average weight 1281 lb. per head when entered.

The daily rations were—

	lb.	
Mangolds	25	with 10 lb. oatmeal.
Hay	10	
Oat-straw	5	
Bran	2	
Do.	do.	with 12 lb. wheat.
Do.	do.	with 8 lb. oats and 4 lb. pease ground.

Value of oatmeal ration daily	10½d.
" wheat "	7½d.
" pease and oats "	7d.

Over all the period of sixty-three days, rotating three groups of animals to each of the rations, they had this per head per day record, each animal—

Oatmeal, ·47, or almost ½ lb.
Wheat, ·93, or nearly 1 lb.
Pease and oats, 1·30, or about 1¼ lb. added to the live-weight.

That there was interesting material here cannot be doubted; the most prominent back-going occurred when the changes were made from oatmeal, so that the whole study was no doubt worth the *testing shot.*

Beef from improved Permanent Pasture.

With all its wealth of things in nature, Canada had found herself unable to cope with England in maintaining that piece of pasture that has ever shown the world the cheapest and the best form of animal maintenance for growth or milk all the season there. Somewhere about 1882 the Guelph experimental authorities considered they were due the farmers a decided guide on this question of improved permanent pasture; previously Ontario had to tell that her average cultivated hay-runs and natural meadows required fully three acres to maintain one cow or one two-year-old "store," or, let us say, at the rate of

2300 lb. of milk, or 185 lb. of beef weight, per season of five and a half months.

Several of the most likely grasses and clovers had been well tested, and the following selection chosen:—

	lb		lb
Meadow fescue	6	Lucerne	4
Meadow foxtail	3	White clover	2
Red top	2	Alsike	2
Cocksfoot	3	Red	1
Kentucky blue	4	Yellow	1
Timothy	3		—
Perennial rye	2	Per acre	35
Yellow oat	2		

Seeded down in 1884, up to which and subsequent seasons the management had been all that practice and science could command, when this record of two-year-old pasture was noted in 1886: "The pasture is still holding two cows per acre easily, and producing at the rate of 7692 lb. of milk per season of five and a half months by common grade cows—cows that under any other good conditions never gave over 25 lb. per head daily. Had they been Holstein, Ayrshire, or Bates Shorthorns, the season's produce might have amounted to about 14,000 lb. of milk per acre." The four two-year-old steers were not able to keep down the $3\frac{1}{3}$ acres of full-covered ground—no grain had been given; these Shorthorn grade steers made an average daily gain to their live-weight of 3·03 lb. per head from 20th May to 31st July, and kept up to 15th October an average rate of 2·15 lb., hence a live-weight per acre of 312 lb. for the short season.

Nothing illustrates the stamina and possibilities of Canadian soil and climate as does this, even assuming a shorter permanency, and allowing for more pasture troubles that have been experienced.

Making Yearling Beef fit for Export to Britain.

This thought with the Canadians originated, I think, from the Guelph experimental farm as far back as 1884. It was sound nationally, because it meant greater progress, more rapid circulation of money, and a general welldoing, as it also implies a better system in farm practice, more scientific knowledge, and the investment of more capital in the special business. The sample then recorded was a first cross between a Hereford bull and a Shorthorn grade cow that was calved 28th November 1883. The calf weighed 103 lb. at birth, and after suckling its mother for six months, got hay, bran, ground oats, and a "smell" of oilcake, all in moderate quantity, from three months old until 1st June 1885; it was also allowed to graze both

seasons, when, closing as a twenty-four-months-old, it scaled exactly 1460 lb. alive. This was no very special example, nor was the feeding anything unusual, and yet it is worthy of record in Canadian enterprise.

Food in Cattle Life.

Possibly the most practical and interesting of the tests in the first decade of Guelph's experimental history took place in 1883-84, when twenty-one steers were sent through a complete ring of beefing agencies; these and their market prices were—

		s.	*d.*
Maize	.	2	7 for 56 lb.
Pease	.	3	0 " 60 "
Oats	.	1	8 " 34 "
Barley	.	2	9 " 48 "
Bran	.	44	0 per ton.
Linseed-cake	.	120	0 "
Swede turnips	.	0	4 for 60 lb.
Mangolds	.	0	5 "
Hay .	.	40	0 per ton.

The animals were divided into seven groups of three each, and as the test term was twenty-eight days, the whole feeding period amounted to 196 days to complete the period. The steers were half-bred Shorthorns, coming two years; every article of every meal was weighed, stall temperature kept daily, the feeding times being 7.30 A.M., 11.30 A.M., 2 P.M., 5 P.M., and 8 P.M., with exercise before noon meal, and rock-salt always in manger. All the water they consumed was also *weighed*, and the animals themselves every week. All the grain food was ground roughly, roots being sliced, and the hay given whole, except when cooked.

And now, without keeping straight through this great paddock of bullock-growing possibilities, let us pick up a few of the most attractive flowers as they come across our path—something that may even brighten our British homes.

The making of beef for the British market seems to enable Canada to calculate very accurately both as to food required and results in animal increase. The grain and fodder crops are profuse and cheap, and, as generally understood, excellently adapted for the purpose. It requires no science to know that a mixture of all, or nearly all, the crops of the field is a good thing for cattle life. Experience is plentiful amongst us on this subject, and yet we do not know much about the effects of special foods, or certain combinations of them, under precisely similar conditions. So this experimental station sensibly made a mixture of equal parts of ground pease, oats, barley, and

maize, along with the usual quantity of hay *weight for weight* with the grain, and then the quantity of these made up the allowance of roots that go to finish the daily ration of the bullocks put up in the autumn to be finished during the winter when two years old. Such was the standard guide in this case, thus:—

	lb.
Grain	10
Hay	10
Roots	20
Daily . . .	40

The results were:—

	Daily rate increase per head. lb.	Cost, adding 1 lb to live-weight. d.
Grain mixture	$2\frac{1}{4}$	$4\frac{1}{4}$
Grain mixture with oilcake . . .	2	$5\frac{1}{5}$
Grain mixture with Thorley condiment .	$2\frac{2}{5}$	$5\frac{3}{4}$
Maize alone	$2\frac{1}{3}$	4
Pease "	$1\frac{3}{5}$	$5\frac{1}{2}$
Oats "	$1\frac{3}{4}$	$5\frac{1}{4}$
Barley "	$1\frac{1}{2}$	6
Hay, roots, and bran	$2\frac{1}{7}$	$4\frac{1}{4}$
Uncooked	$2\frac{3}{5}$	$4\frac{1}{5}$
Cooked	$1\frac{4}{5}$	$4\frac{1}{2}$
Hay pasture	$1\frac{1}{7}$	$2\frac{1}{2}$
Improved permanent pasture . . .	2·05	1

At the close, therefore, of a long series of tests, this plain standard gave the *second best* results in what everybody aims at —rapid growth and cheap production.

The first comparison naturally will be with the separate grains that made up the lot. When, therefore, we have the distinct evidence by twenty-one head of cattle throughout seven months, that maize as a regulating portion of the ration has given in cheap and rapid production no less than 25 per cent better results than the average of all the others, and ten pér cent better than the best of the others, a fair judgment can be made as to its value in the winter feeding of cattle, irrespective of any chemistry, for chemistry does not place it so high as most of the others.

The grand average of daily rate of increase and cost of production is 2 lb. at 5d. per pound live-weight.

For rapid and cheap production combined, maize is decidedly ahead, then the mixture of grain, followed by uncooked food, with hay, roots, and bran; all the others are above the average both in cost of production and slow rate of production.

While of course it is usually quite irrelevant to ask of any country if its experiments ever pay directly, I may be excused for giving this one example. In connection with the lot another

animal of the same character came in, and together forty head was sold for shipping to Britain. They averaged 1355 lb. and fetched $3\frac{1}{4}$d. live-weight, thus realising £704 at the yards in June. When purchased in previous October they weighed 931 lb. and cost £372. The account, therefore, stands simply thus:—

Market cost of food consumed . .	£168 0 0
Sold for export	704 0 0
Difference	535 0 0

The British farmer need not be bothered with any argument relating to the value of attendance, bedding, and manure. The animals fetched £13 a-head more than the price paid for them and their feeding. What better rate of return do they want than that in Britain or anywhere else?

Sheep-Feeding.

A circumstance to record is, that none of the five stations of the Dominion proper has as yet touched upon wool and mutton in experimentation—I presume very much because of other animal life being more important there, and that, as a whole, a close forest-land is not naturally a sheep one: how few know the fact that Canada possesses more cattle than sheep in her economy. Going back upon Guelph work, we have, however, a considerable field to overlook.

In 1898 a good suggestive closing was made in fattening lambs with pease, and with maize, against each other. Eight animals were used, group I. being fed on equal parts by weight of pease and oats with clover hay, group II. getting maize and oats with clover hay; the experiment lasted 74 days and resulted thus:—

	Group I. Pease and oats lb	Group II Maize and oats lb
Grain consumed . . .	456·75	456·75
Hay	802	802
Average weekly gain . .	2·10	2·29
Meal consumed per lb. gain .	5·14	4·72
Hay per lb. gain . . .	9·03	8·27
Cost per lb. gain . . .	$3\frac{1}{2}$d.	$2\frac{1}{10}$d.

In estimating the cost of the fodders, the pease are valued at 2s., and the maize at 1s. 7d. per bushel, while the hay stood at 25s. a ton; so that the experiment gives a marked difference in favour of maize, both in rate of gain and cost of gain, and, at the same price per pound for maize and pease, the maize would still have the advantage.

Fattening Lambs for British Market.

For three years, ending 1893, Guelph gave considerable attention to testing the financial issue of preparing lambs and shipping them to the British market. They repeatedly purchased in October a compact, medium-sized, cross-bred, dark-pointed lot, and chose the best from them. Up to shipping-time in May, oats, pease, bran, roots, and hay were fed with due regard to exactness, and even a touch of wheat and ensilage to balance anything that may not have been apparent.

Number exported	297 head.
Weight before shipping	130 lb.
Price in England	44s. 6d.
Cost per head shipping and sales	13s. 9d.
Selling price, less cost exporting	33s.
Price live-weight in England	4½d. per lb.
On an average these lambs cost before entry for testing	16s. 8d.
Weight on entry	75 lb.
Increase per head	55 lb.

Some of the results are difficult to understand throughout repetitions during three years, but the report says:—

1. Grade lambs can be purchased in Eastern Ontario and Prince Edward Island, sent 1000 miles west to Guelph, fattened, and disposed of in England at a substantial cash profit.

2. That the average grade lambs of Ontario are well adapted for such preparation.

3. That lambs shipped to England should sell for an advance of about 1d. per lb. live-weight on the prices obtained in Ontario to secure an equal profit.

4. That lambs may be fattened in winter in considerable numbers, with but a small percentage of loss from disease or accident.

5. That grade lambs similar to these can be fattened in good form in winter—when fed daily, the following ration: 2 lb. oats, 2 lb. pease, and 1¼ lb. bran per head per day.

6. That this ration gives an average daily increase in weight of ¼ lb.

7. That a ration of rape pasture only gave a larger increase than the winter one in this experiment.

In the 1887 report of Guelph, on the other hand, we are told: "We have been trying for twelve years to impress the farmers with the fact that one of the most prominent weaknesses of Canadian agriculture is unappropriated land and non-production of wool and mutton, . . . these having no reference to productions of pure breeds as a speciality, but the use of them with the common sheep of the country in order to realise annual crops from the so-called comparative worthless possessions of

each farm, in addition to pasture connected with arable." There was no belief in unequal revenue being realised in wool and mutton by any method of sheep management per acre from the best cropping soil, as compared, for example, with dairy products, and so the real aim of the notes now to be submitted was to test the ability of improved pasture on similar soil to maintain so many sheep per acre per annum, and compare with cows and store cattle. For this purpose they chose a four-year-old acre of permanent pasture similar to that mentioned lately in cattle maintenance.

Divided into rotating subdivisions, and beginning on 5th May with Oxford, Shropshire, and Cheviot ewes, to which two others were added to keep down roughness on 23rd May. These seven sheep being unable to master this, seven stock rams were added on 9th June, thus making fourteen head in all. These rams were removed on 2nd July, and two of the ewes on 3rd August, when the extraordinary dry season was telling, all the time that no grain or extra food of any sort was allowed. This testing was closed on 1st October, when stock had to be changed for service; but other sheep were added and grazing continued until snow appeared on 20th November.

Thus the average depasturing from 5th May to 1st October was fully seven head per acre; the increase to weight having been 22 lb. per head. This is the simple significant statement, that possibly has not yet taken deep root in Canada, remembering also that ordinary pasturing there has been considered a good thing at the rate of one sheep per acre all the open season.

Swine-Fattening.

In 1891, at Ottawa, several important experiments were undertaken with twenty-four head Berkshire cross-bred pigs, six lots of four each being set aside. The object was to discover the difference, if any, in the quantity of dry cold grain and of cooked warm grain required to produce every pound of increase in the live-weight of the animals during different stages of the feeding period. A mixture of equal parts of ground pease, barley, and rye was fed wet in both cases, cold water given, and a mixture of salt and wood-ashes kept in a box for each pen, to which access was allowed at will. Food was weighed every day and the pigs every week.

Taking in the whole period from 9th December to 18th May the results were:—

Four and one-sixth ($4\frac{1}{6}$) lb. of the mixture of grain were consumed for every pound of increase in the live-weight, when fed *steamed and warm*, as against $4\frac{1}{4}$ lb. of the like when given raw and cold.

The pigs on steam-warm food gained $702\frac{1}{2}$ lb. live-weight, as against 564 lb. gain on raw cold food; but the former consumed 2928 lb. of grain, as against 2398 lb. by the latter, showing that when steam-warmed the animals ate larger quantities than when raw and cold. They also gained faster in weight, but every pound of increase cost practically as much grain in both cases—there was nothing to compensate for extra labour in steaming.

During the winter of 1891-92 experiments were begun to discover the effect of feeding swine upon a ration of grain only, ground and unground, as compared with a ration composed of grain and skim-milk. Four pens of two pigs each were selected, as nearly as possible equal in breeding, quality, age, and size. From this testing, over seventeen weeks, it appears that—

(1) 4·45 lb. of a mixture of equal parts of pease, barley, and rye, *not ground*, but soaked in cold water for forty-eight hours, were consumed for every 1 lb. of increase in live-weight.

(2) 4·36 lb. of the grain were consumed per pound of increase in live-weight when it was fed *ground* and soaked for twelve hours.

(3) 1 lb. of grain was the equivalent of 6·65 lb. of skim-milk in increasing the live-weight.

(4) The swine that were fed upon a ration containing skim-milk were lustier and more robust in appearance than those fed upon grain only.

The first test in the next series was undertaken to discover what results would be obtained from the fattening of large-sized swine upon a ration of *frozen wheat*, and how that would compare with a mixture of equal parts by weight of pease, barley, and wheat for increasing weight.

Twelve grades were put up into three lots, age and breeding not known, the average size at commencement being 186 lb. each.

1. When the frozen wheat was fed *ground* and soaked for twelve hours, 11·3 lb. of increase in the live-weight were obtained per bushel of wheat.
2. When the frozen wheat was fed *unground* and soaked for forty-two hours, 9·1 lb. of increase in the live-weight were obtained per bushel of wheat.

Then, with swine weighing an average of 61 lb. each in the one pen, and an average of 104 lb. each in the others, it was found that—

3. When the frozen wheat was fed *ground* and soaked for twelve hours, there were obtained 14·18 lb. of increase in the live-weight per bushel of wheat.

4. In the feeding of swine from an average of 61 lb. each until they reached an average of 145 lb. the increase amounted to 15·46 lb. per bushel of wheat.
5. So that altogether where a less or greater quantity of wheat may be injured by frost, the farmer may well fortify his position by providing such pork agency, which returns from 9·1 to 15·46 lb. of increase in live-weight from every bushel of damaged wheat.
6. When pork is fetching 2½d. per lb. of live-weight, and allowing 5 per cent of shrinkage, the frozen wheat would fetch from 1s. 10d. to 3s. per bushel.

This is a highly important inquiry that, in association with other favourable conditions of pig life, may be judiciously extended where large wheat production is carried out.

The Experimental Dairy in Canada.

I ask for this comprehensive name because of the world-wide place Canada has already taken in cheese and butter production. The work has been so full and practical and scientific, that those outside have the idea of some great manual having been all along used to guide its people in detail manipulation. Hence it can be at once inferred that the accumulation of annual reports, monthly bulletins, and lectures, could well be culled to make such a manual, and as nearly all the teaching and the success have been experimental for their special conditions, these notes might well stand for a Canadian text-book. Keeping to the strict tests that have emanated from Guelph and Ottawa — 1876 to 1897 — we shall note them tersely as follows:—

1. *Milk from Improved Pasture.*

Two Shorthorn cross-bred cows were kept for five and a half months, or the grazing season, on two acres of three-year-old permanent pasture, and gave 7692 lb. of milk. During the same season and time one acre of similar pasture gave 6670 lb. of milk from two cows that at the same time added 217 lb. to their live-weight. These two cows voided about 4680 lb. of solid manure from this one acre. The milk from this pasture stood an average of—

Water	88·85
Fat	3·31
Solids other than fat . . .	7·84
	100

The manure analysed gave—

Water	82·76
Organic matter	12·93
Insoluble matter . . .	2·09
Iron and alumina . . .	1·03
Lime	·69
Magnesia	·21
Nitrogen	·25
Undetermined, such as soda and potash	·04
	100

2. *Milk Character in Winter.*

One cow each of Ayrshire, Holstein, and Jersey, about four years old, and one month after calving, gave for five months of a winter milk per day:—

	lb.
Ayrshire	20
Holstein	22
Jersey	18

Their milk from deep setting at 40° gave a cream percentage—

Ayrshire	12·81
Holstein	11·68
Jersey	18·52

And the butter from 100 lb. of that cream was—

	lb.
Ayrshire	37½
Holstein	30¾
Jersey	43⅓

And the dried cheese curd from 100 lb. milk, less 10 per cent, amounted to—

	lb.
Ayrshire	13½
Holstein	10½
Jersey	14

Paragraph 2 represents 134 separate tests in cream, 12 in butter, and 12 in cheese. The highest individual churning was 50 lb. per 100 of cream from Jersey.

3. *Milk Character in Summer.*

From the same cows in May and June on pasture, and in calf again, there were—

	Milk.	Cream.	Butter.	Cheese.
Ayrshire . . .	15	14·7	49·3	15·7
Holstein . . .	21	8·8	31·0	12·3
Jersey . . .	22	14·2	61·0	17·3

So that, with three leading breeds, the milk quantity remained practically unchanged from winter to summer. In summer the cream was 2 per cent less, when, however, no less than 10 lb. more butter was got from the like weight of cream—from 37 lb. to 47 lb. on an average. In cheese the difference is equally striking—from 12·2 in winter to 15 lb. per 1000 lb. of milk in summer. The conduct of cow individuality is worth noting: the Ayrshire increased very prominently in cream, butter, and cheese proportions, from winter to summer—indeed the only one to increase her cream percentage; that the Holstein decreased in cream from 11·68 to 8·8, and yet held almost exactly to butter yield, may seem a contradiction; but the Jersey not only gave 4 per cent less cream proportion in summer, she actually gave 18 lb. more butter in summer from the 100 lb. of cream, and 30 lb. more from her cream than the Holstein did.

4. *Cream in Winter from Seven Classes of Cows.*

	Deep setting at 40°.	Deep setting at 60°	Difference.
Jersey	19·2	11·2	8·0
Ayrshire	18·7	9·5	9·2
Shorthorn	17·8	11·4	6·4
Shorthorn Cross . . .	15·6	12·8	2·8
Aberdeen Poll . . .	12·7	8·4	4·3
Galloway	11·8	6·2	5·6
Holstein	10·0	1·9	8·1
Mean	15·1	8·8	6·3

The setting cans were 20 inches deep and 8½ diameter; milk was allowed to stand twenty-four hours before creaming, and 750 *separate tests were undertaken.*

The point is the really extraordinary difference of volume, or bulk, of cream in favour of a temperature of 40°. It will be observed that setting at 60° told best with the Shorthorn cross, or grade, for it gave only 2·8 more cream at 40°.

5. *Cream in Summer.*

	Deep setting at 40°.	Deep setting at 60°.	Difference
Jersey	20·0	16·1	3·9
Ayrshire	18·8	15·5	3·3
Shorthorn Cross . . .	18·0	13·8	4·2
Shorthorn	16·8	12·9	3·9
Guernsey . . .	16·2	11·1	5·1
Quebec grade . .	14·0	11·5	2·5
Holstein	13·8	8·5	5·3
Devon	11·7	7·5	4·2
Mean . .	16·2	12·1	4·1

Comparing these, and allowing for the difference of breeds, and tying them with the previous winter results, there is an increase of 6 per cent more cream in summer by setting at 40°; but the large difference of 3·5 per cent more during summer at 60° than the same in winter, is a fact attributable, no doubt, to better rising conditions according to seasons.

6. *Cream from Ten Sources, in comparison with Centrifugal Separation.*

	Setting at 60°.	Setting at 40°.	Centrifugal.
Aberdeen Poll . . .	8·4	12·7	11·6
Ayrshire	9·5	18·7	15·0
Devon	8·0	...	14·5
Galloway	6·2	11·8	14·6
Guernsey	5·0	...	7·1
Jersey	11·2	19·2	13·0
Holstein	1·9	10·0	11·9
Quebec grade . . .	8·5	...	13·7
Shorthorn	11·4	17·8	15·0
Shorthorn grade . . .	12·8	15·6	14·7
Mean . .	8·5	15·1	13·1

All these, I repeat, were obtained from December to May, and consequently under the more unnatural milk conditions. Through ten distinct sources, then, entailing some 135 separate experiments, milk was subjected to three conditions for the separation of its cream, the object being to test the power of the separator in comparison with the best-known deep methods. First note that in a temperature of 60° for twenty-four hours the outcome was 8·5 of cream, and at a temperature of 40° it rose to 15·1; that this great difference was the result of low cooling is clear; that 20° of lower temperature did raise about 7 per cent more cream from ten different sources of milk is an important practical fact; and that the mean of the two temperatures allows about 2 per cent in favour of the separator —the while, nevertheless, that 40° on an average did better than the machine by 2 per cent.

The Chemical Analysis of Milk from Ten Sources in Winter.

	Water.	Fat.	Solids other than fat.
Jersey	84·55	7·35	8·10
Shorthorn	85·17	5·63	9·20
Ontario grade . . .	86·75	4·65	8·60
Ayrshire	88·20	4·60	7·20
Devon	86·70	4·45	8·85
Shorthorn grade . . .	87·40	4·40	8·20

	Water.	Fat	Solids other than fat
Galloway	85·72	4·38	9 90
Quebec grade	87·20	4·00	8 80
Holstein	87·45	3·55	9 00
Aberdeen Poll	88·43	2·87	8·70
Mean	86·77	4·58	8·68
Comparison with British mean	87·25	3 50	9·25

The extreme of percentage of water was 88·43 from Aberdeen Poll, and 84·55 of that of Jersey. The lowest butter-fat, 2·40, was from Aberdeen Poll, and the highest, 7 50, from Jersey, and the reader can easily make a whole lecture from such a table. The milk was all sent to the laboratory by numbers only, without a name, and came back so well defined by "breed-character" —photographed, as it were, in nearly every sample.

And yet to assert that the whole position is unmistakably one of breeds leads to this trouble:—

	Beefing.	Dairying.
Shorthorn	5 63	...
Galloway	4·38	...
Aberdeen Poll	2·87	...
Devon	...	4·45
Jersey	...	7·35
Ayrshire	...	4·60
Holstein	...	3·35
	4·26	4·93

A peculiar agreement on the whole. But look at another presentation of the record:—

8. *The Chemical Analysis of Milk from similar Sources during Summer.*

	Water.	Fat.
Ayrshire	84·75	6·85
Jersey	86·15	5·89
Shorthorn	86·65	4·35
Quebec grade	87·10	4·15
Holstein	88·80	3 90
Devon	89 00	3·80
Shorthorn grade	87·45	3 65
	87·10	4·66

So that summer conditions may have, therefore, added about 1 per cent more water, slightly reduced the butter-fat, and thus all over, variety of food and physical conditions appear to have had little effect in changing the constituents of milk throughout a number of breeds.

9. *Size of Butter-Globules in Milk.*

Another interesting and important experiment was carried out with so many breeds under precisely equal conditions, to test *the size of butter-globules* in milk, in which experiment as many as 221 observations were undertaken during the winter months with a microscope magnifying up to 670 diameters.

	Average time after calving. Months.	Size of large globules.	Per cent of small globules.
Aberdeen Poll	1	1·40	·33
Jersey	6	1·39	·33
Ontario grade	2	1·37	·33
Holstein	2	1·27	·50
Shorthorn	3	1·25	·60
Galloway	3	1·14	·66
Devon	4	1·06	·33
Ayrshire	7	1·00	·50
Shorthorn grade	6	·95	·40
Guernsey	8	·93	·64
Quebec grade	6	·78	·50
Hereford	8	·50	·68
Mean	5	1·08	·48

There having been no standard to compare by in the past, and as the proportion of an inch when into the hundreds and thousands is impossible to grasp, common though the quotation be, the Guelph authorities called the size of butter-globules in milk simply 1·00, and so on up and down, as applicable to their diameter. But as the milk of the Ayrshire breed has been well known, it was used as a standard or unit; so that whatever microscope may now be used anywhere, it would be best to follow this Ayrshire standard and call it 1·00. Hence it may be useful and interesting to reproduce here the following exact copy of the diagrams (Fig. 24) that were used for this Canadian work, where, fortunately, as many as ten different breeds were illustrated.

In examining the table, take the Ayrshire with its valuation of 100 and its proportion of small-sized ones as equal to one-half—above and below this observe the variety of the sizes. The table indicates generally that size of globules has nothing to do with a dairy breed or type as against a beefing one; that, nevertheless, the Shorthorn and Aberdeen Poll hold a high place over the standard; that the proverbially rich Jersey and poor-quality Holstein are equally high, yet all differing very much in per cent of small globules. The diagrams are not made exactly as seen under the microscope, because there would be more variety of sizes; but, giving one size (the larger) *as the mean of the largest globules of each class*, we can by the unaided eye more readily

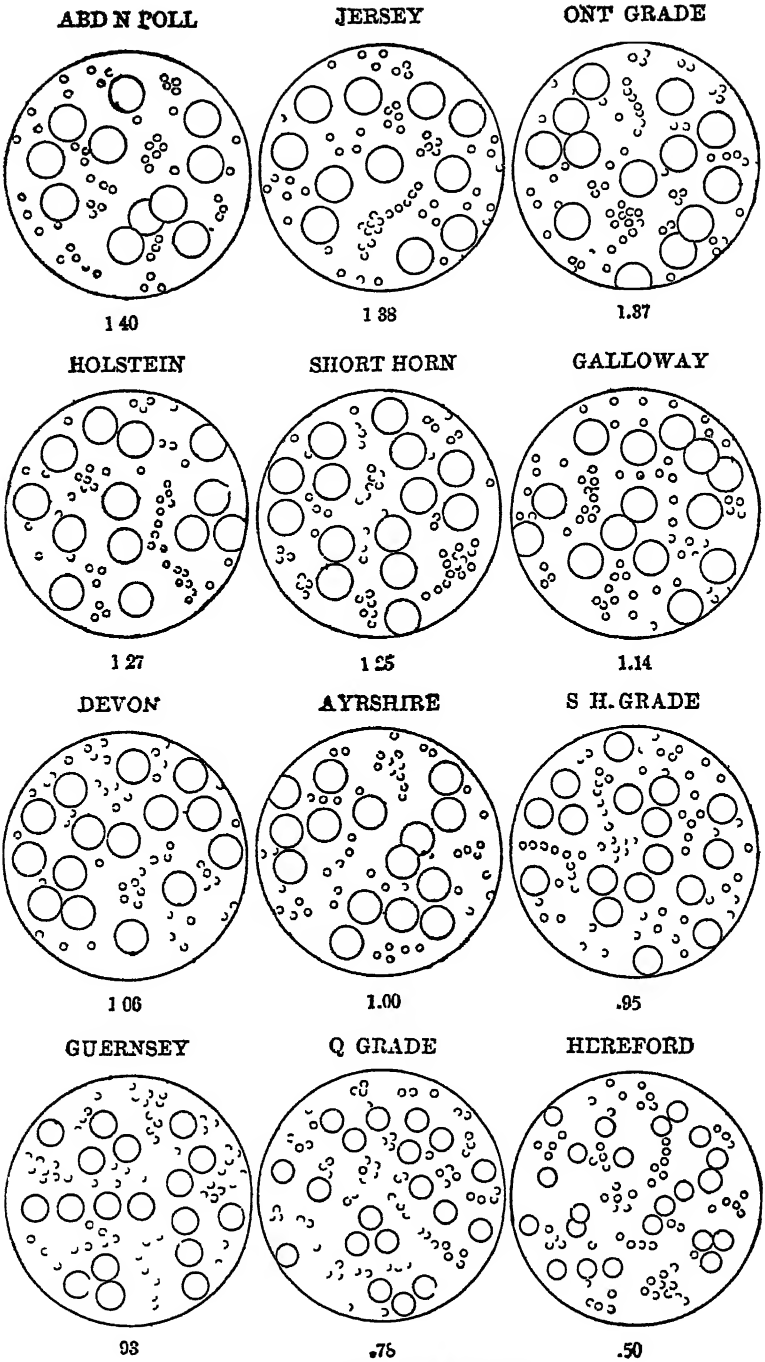


Fig 24 —*Butter Globules in Milk*

make comparisons. The small ones are merely introduced to make the general appearance more natural, and therefore have no actual connection with the results tabulated. That two beefing types should head and end the list may be noted as singular.

10. *The Size of Butter-Globules in relation to Cream obtained by Setting.*

This need be but a simple statement with little comment, and first the statement of facts:—

	Globule. Size.	Cream Mean at 60° and 40°.	Fat by chemical analysis.
Aberdeen Poll . .	1·40	10·5	2·87
Jersey . . .	1·38	15·2	7·35
Holstein . .	1·27	6·0	3·35
Shorthorn . .	1·25	14·6	5·63
Galloway . .	1·14	9·0	4·38
Ayrshire . .	1·00	14·1	4·60
Shorthorn grade .	·95	14·2	4·40

It would be natural reasoning to say that the larger the globules the more cream in the shortest time, because of their size floating easier and coming to the surface more rapidly: this is upon the supposition that globules are numerous, or, in other words, that the milk is rich in fat. In addition, therefore, to the cream obtained by a mean of deep setting in two low temperatures, look also at the chemical analysis of the milk; the only agreement of the three things is in the case of Jersey and Shorthorn, so that the inference is that large globules do exist in "thin" milk—example Holstein—and that thin milk so-called is because it does not give off its cream readily, as example the Galloway, which does possess over an average proportion of fat, as well as an over-average size of butter-globule.

11. *Churning in relation to Size of Butter-Globule.*

This was evidently a pert practical experiment, if not one of a highly scientific character—it was both, let us say—on a simple enough fact, thus:—

	Time churning. Minutes.	Globule. Size.	S.=Summer. W.=Winter.
Guernsey . .	10	2·00	S.
Jersey . . .	17	1·64	S.W.
Ayrshire . .	22	1·45	"
Devon . . .	24	1·33	"
Holstein . .	40	1·51	"
Holstein Shorthorn .	40	1·33	"
Shorthorn grade .	40	1·22	"
Mean .	28	1·50	

This must be interesting to every dairyman; the usual idea of temperature and ripeness of cream as chief regulators in "butter-making" must be respectfully acknowledged, but the size of globules is also evidently no inconsiderable factor in the act. During both winter and summer an exact record of the time occupied in the churning of butter from all the sources named, and all conditions inside man's ken, were of course attended to at a temperature of 62°. As the seasons are not separated in this abstract, the reader will remember that the average time of churning in winter was twenty-five minutes, and thirty in summer.

In every case but one, time and size of globules agree in a very marked manner—the short time and the large globules being inseparable; step by step the churning-time led up from ten minutes with 2·00 as the globule size, to forty minutes and a butter-globule of 1·22. The exception is that of Holstein, which, though possessing an average globule of 1·51 (the exact average having been 1=50) took as much as forty minutes to bring butter; the extremes were twenty and fifty-three minutes. Now, while the Holstein had always given a good average globule of the larger kind, it had also much heavy cream, as clearly shown in other reports from Guelph.

12. *Cheese-making Experiment.*

A well-planned, well-executed, and extensively arranged cheese-making experiment—averaging 300 lb. of milk every time—was undertaken at Guelph the whole season of 1894, the results of which are well worth studying:—

	Per cent fat.	Milk	Cheese cured.	Lb. milk for 1 of cheese.	Cheese for 1 lb. fat	Fat left in whey.
		lb	lb.			
May	3·64	2100	200	11·11	2·47	·25½
June	3·89	1800	177	10·14	2·53	·19
July	3·53	1800	245	11·06	2·58	·27½
August	3·59	1800	160	11·25	2·47	·23
September	3·50	1800	174	10·90	2·65	·12
October	3·75	1500	193	10·16	2·63	·14
November	3·67	1800	176	10·25	2·66	·12½

Summed up, the year's results show—

1. A difference of 113 lb. cheese in favour of the richer milk.
2. A difference of 1·3 lb. milk in favour of richer milk.
3. A difference of ·15 lb. cheese in favour of the poorer milk per each pound of fat.

4. The loss of fat in whey was ·19 per cent for the richer milk, and ·18 per cent for the poorer.
5. The results indicate that adding 1 or even 2 per cent to the fat reading in their tests is more nearly correct than paying by weight of milk, or by the fat alone.
6. The highest average score of cheese made was in the group where milk ranged from 3·55 to 4·00 per cent of fat.

13. *Ensilage and Turnips.*

As a third special test between maize ensilage and swede turnips in milk production from November to March, with four cows equally matched as regards class and time since calving, alternating each lot every month, we have the following:—

The average daily consumption of food was—

Ensilage 30 lb., hay 9 lb., and bran 13 lb.
Turnips 30 lb., " 9 lb., " 13 lb.

The cows on ensilage began with 1187 lb. and closed with 1207 lb. per head each in live-weight, and on turnips from 1185 to 1192 lb., the produce being per head daily—

	lb.	Per cent.
From ensilage . .	28	$9\frac{1}{2}$
From turnips . . .	29	9

The balancing of everything in this experiment is very striking.

Individuality and Feeding.

As a fitting finish to these notes on Canadian experiments, I beg to give what may be called an undiscovered check in the feeding of a milch cow at Guelph. They had an ordinary Shorthorn cross, fifteen years old, that had been nursing a calf for seven months, and was set aside to be dried off by hand-milking once a-day after the calf weaned. At that time she was giving a little under 10 lb. milk daily, and as she would not respond to this drying, even upon reduced food, the authorities set her aside for this experiment—they called it, "Educating the cow."

Choice was made of the following rations in this education:—

		lb.
1st ration:	Hay 12 lb., swede turnips 10 lb., mangolds 10 lb., carrots 4 lb., maize 3 lb., and barley 3 lb. . . .	42
2nd	as above, and 3 lb. oats, and 3 lb. middlings	48
3rd	as above, and 3 lb. bran . . .	51
4th	as above, and 3 lb. pease . .	54
5th	as above, and 3 lb. linseed-meal .	57
6th	as above, and 3 lb. cotton-seed-meal .	60
7th	four-year-old permanent pasture alone, as described previously, quantity unknown . . .	

Thus, step by step, the cow was treated to meals increasing in quantity and nutritive ratio, week after week, and in order to dissipate any influence from the previous week's treatment, one week was allowed between each new ration before actual testing began, so that the whole period extended over fourteen weeks—milking twice a-day, feeding three times, with plenty water, salt, and moderate exercise. She was not put in calf again, and hence food was only used for self-maintenance and milk production.

The story of results is given in the appended table. The milk did not increase materially in quality, nor did the cow increase or lose in her own weight. One thing very marked during experiment was the unsatiable appetite — apparently never satisfied until put to grass, when, of course, they did not know how much she consumed.

In the table notice the very marked agreement between the milk received and the amount of food digested, which latter fact, remember, is according to the chemist. In every instance they are near enough to be called copies of each other: for example, ration 1, with its 13½ lb. digested material and its milk issue of 20 lb. a-day, is just 1½ of itself—*i.e.*, 13½ and 6½, equal 20; ration 5, having 22 lb. digested and a milk issue of 33 lb., is exactly 22+11=33; and so on with the others. No. 7, as pasture, was not given; but reverse the calculation and obtain 28 as the equivalent of its digestibility: 28 and 14 make 42 lb. milk, as representing the high-feeding value of 1:4:50, or 1 of albumen to 4½ of carbohydrates simply:—

	Ration. lb.	Feeding value.	Milk per day. lb.
Ration 1 digested .	13½	1 : 7 : 37	20
" 2 " .	16⅙	1 : 7 : 15	23
" 3 " .	18	1 : 6 : 75	27
" 4 " .	20½	1 : 5 : 99	32
" 5 " .	22	1 : 5 : 03	33
" 6 " .	23	1 : 4 : 78	36
" 7 pasture .	.	. 1 : 4 : 50	42

What these Experiments have done for Canada.

Thus, abstractly, we have gone through a forest of farm life and one of its tributaries, that British readers as a whole can only have had glimpses of in the short past; and now that we possess a fair gathering of the experimental cream of the branches named, we may indulge in a sort of congratulatory note.

Wisely, Canada has made no advance-dip into the praises of its agricultural experimentations—reserving maybe to herself any wider application of principles and facts, as England herself

could well do with reference to farm stock, by the way. But, have the various problems so far elaborated not shown several irregular lines of previous practice, and some new and bright ones for Canadian rural economy—not forgetting the valuable confirmations of others for and against progress?

Remember that Canada, because of her comparative youth and stimulating alliances, has had, so to speak, to do more private experimentation than smaller and older mother-lands ever needed to do, and so the systemised material now accumulating upon her comes with less force and therefore less noise in this steady science and art of the world's farming.

Did the axe-men and grain-growers of the Dominion forty years ago imagine that ere the close of the century they would not only be in actual possession of great numbers of distinct types of established European cattle and sheep, but would have them repeated again and again with their successive progeny—put through their own conditions of life to prove how far the characteristics they brought would withstand three thousand miles of a great continent?

Did those same men think that even their children—not waiting for another generation—would ever grow and export and *undersell* the farmers of Britain in beef, cheese, and pork, and also would be asked to send experts to the old land to teach how a superior cheese—the world's cheese—should be made? So fast and famous became the science-bound cheddar of Canada, that even the writer remembers the day of splitting hairs for "acid" strength, and of obtaining a "long-one" (the hot-iron test) on a maturing curd.

Then came the day of butter-fat, as has been shown, and whether a globule had or had not a pellicle to keep it together. The butter-making story of Canada began about the 'Eighties, and that it is spreading bravely but slowly is but evidence of man's limitations when two good things (cheese and butter) have to come from one source in one country. If I remember correctly, Holland is the exception of being able to export both articles to a large extent *per capita*, but then it is Dutch cheese only.

So also with swine, which, because of pliability, have not needed much Canadian thought—other than raw *versus* cooked food; so that in association with so much prominent dairying, pork yet stands in the foreground of simple, practical, Canadian economy.

FAMOUS HIGHLAND BULLS AND COWS.

By James Cameron, 'The Dundee Advertiser,' Dundee.

It is a happy circumstance that the once common yet rather empirical method of classifying Highland cattle under three branches, as well as a more recent fashion of grouping the breed under the dual orders of Highland and West Highland, has passed away. There is one "fold" and one Herd-Book. But an excuse can be found for the classifications of other days. Soil, climate, and restricted use of sires effect remarkable differentiations in the course of so short a period as twenty years, and when the foundation elements had one distinctive family stamp.

Colour.

Much need not be made of a colour scheme in tribal history. Early in the century, and far back as any scanty writings and traditions are available, the standard colour of the Hebridean cattle was black; but the dark shade was no doubt due to selection, as there was for long a belief that the blacks were constitutionally the strongest and the most profitable. The existence of brown or *donn*—an approximation to black, with light colouring round the muzzle and along the spinal column—goes far back in western annals, and points to the fact that dark reds were favoured by some breeders. A black-brindled bull mated with dark-red cows is very apt to leave browns, especially if the females are of the dark-muzzled or *bus dubh* order. But if black be easily retained, there is no special difficulty in causing a sway from medium shades to broken colours, pale yellows and silver duns almost merging into white.

On the mainland variety of colouring has been popular from time immemorial. Thirty or forty years ago, and farther away, many graziers had a liking for the Chaisfhionn or white-marked stock, because they considered the cows to be good milkers and the steers to be kindly feeders. In more recent times the Sgiathach marking—consisting of winged or scalloped breaks from the underline—has given a family name to one of the most distinguished of prize-winning strains. But streaks and patches of white are not now in special favour.

Noted Folds.

The oldest herd or fold of Highland cattle in the west, taken in unbroken descent, is that at Balranald. The young laird

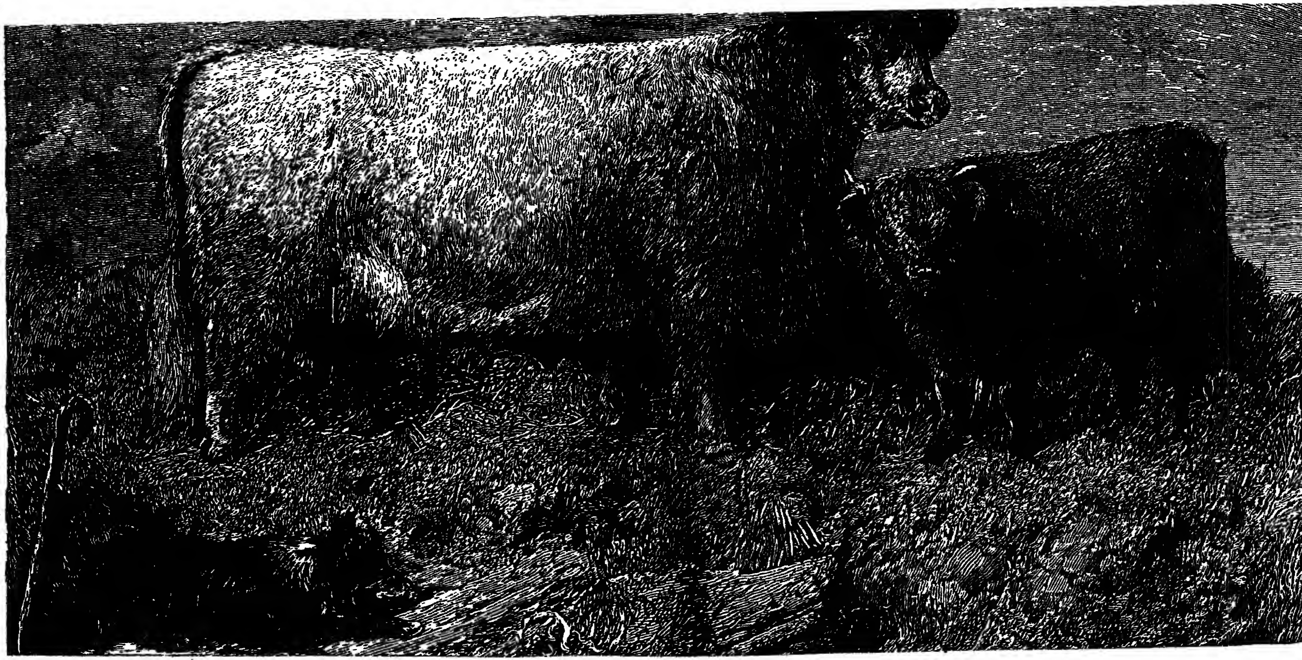


Fig. 25.—Highland Cow and Calf.

Bred by Mr D. M'Laren, Corrychrone, Callander. Winner of First Prize at Perth Highland Shew in 1861. From a painting by Gourlay Steell in the Hall of the Highland and Agricultural Society.

of Balranald is the twelfth of his line on the Uist property; and his father, Mr Alexander Macdonald of Balranald and Edenwood, states that his ancestors in the west, according to family tradition, always had the native cattle. As the Macdonald family has occupied Balranald or its neighbourhood since the fourteenth century, the fold of cattle has in a pre-eminent degree the claims of long descent. In the first volume of the Herd-Book a yellow bull, Seillein (481), evidently from a white-marked strain of cows, is registered as having been calved at Balranald in 1806, and a black son of the yellow, entered as Morchuis (365), was calved in 1810.

The grand herd at Poltalloch is probably the oldest on the west mainland, as it was founded in 1790. On the central mainland the Breadalbane and Trossachs country must be accorded pride of place as the breeding-ground for long generations of cattle which have gone far to make the breed what it now is in size, picturesqueness, and grazing importance. There must have been excellent folds of Highland cattle in Glenlyon, the Trossachs, and neighbourhood, at the beginning of the present century. The oldest men in these districts, linking their own recollections to those of their fathers, are sometimes inclined to doubt whether the breed has made a substantial improvement under the gentler conditions of recent times; but in weighing such informal judgments allowance must be made for the glamour of early associations.

Two of the most notable breeders and graziers in the Glenlyon quarter at the beginning of the century were the brothers Stewart, afterwards so noted in the West. The older of the two—Mr Donald Stewart, father of the late Mr John Stewart of Ensay—went to Lewis in 1802. His younger brother, Mr Archibald Stewart, followed soon after from Garth, and the two took the farm of Park, where they established a fold of Highland cattle with the best of their Perthshire stocks and some western strains. In 1809 Mr Donald Stewart took the farm of Luskintyre in Harris, where he continued to breed cattle for nearly fifty years. Mr John Stewart, who was born in 1825, transferred a portion of the Luskintyre stock to Duntulm in 1844. There the cattle remained till 1882, when they were removed to Scorrybreck and Ensay, Mr John Stewart falling heir to the latter on the death of his uncle, Mr Archibald Stewart.

So far as the writer has been able to learn, Mr Donald Stewart relied a good deal on mating the very best Island strains of cows with first-class Perthshire bulls. The late Mr John Stewart, who rarely sought an out-cross for his broadly founded herd, was fortunate in having some grand families of cows—the best being the Guanachs, tracing back to a cow bought by Mr Donald Stewart at Corrie in Skye; the Targeals, from one

of the heifers taken out of Glenlyon in 1802; the Donnachs, probably of western origin; and the Shellays, from Harris or the island of Shellay on the outer side.

Mr D. A. Stewart says that the bulls Craig-an-Righ and Monachyle, whose names figure prominently at the foundations of Ensay and Scorrybreck pedigrees, were of Monachyle breeding; that Tarbh Herrach was bred at Luskintyre, and Corriechatchan at Corrie. Mr Donald Stewart considered the Corrie cattle of his day to be the best in Skye. Between 1820 and 1840 the cattle bred by the "Chesthill" Stewarts at Auch, Cashlie, and Chesthill were famous all over Scotland. During the second half of the period referred to Mr Charles Stewart had an admirable race of cattle on his beautiful Glenlyon property. At Cashlie his brother, Mr John Stewart, kept a fold of the first rank. The two stocks had far-reaching influence, and their power for good was frankly acknowledged by all unprejudiced judges.

Famous Animals.

With reference to famous bulls and cows it is difficult to glean much information of special value when one seeks beyond 1856 or so, and the repetitions and changes in names of animals, also the want of names and of colour-guides, render the task of sifting any scraps of written matter extremely unsatisfactory. Looking over the prize-lists of the Highland and Agricultural Society for 1822-56, the seeker after "Highland" lore is struck with the fact that the picturesque breed had a wide range in the Scotland of those days. Prominent among the prize-winners for the years in question were—Mr James Dickson, Dunse; Sir John Maxwell of Pollok; Mr Peter M'Intyre, Tighnablair, who won with bull and cow at Perth in 1829; Earl Gower; the Earl of Ormelie; Mr Charles Stewart of Chesthill; the Marquis of Breadalbane, whose name appears for the first time at Perth in 1836; the Messrs Stewart, Lewis and Harris; Mr Colin Campbell of Jura; the Duke of Sutherland; Mr William Grant, Ruthven; Mr Neil Malcolm of Poltalloch; Mr Donald Macdonald, Craigruie; the Right Hon. Duncan M'Neill of Colonsay; and Messrs G. & J. G. Smith, Minmore, who won in bulls at the Paris International Show of 1856.

Between 1840 and 1856 the Breadalbane and Chesthill cattle were in great renown, and in the west, Poltalloch, which had from time to time drawn on the best sources—Taymouth among the rest—was long noted for the size and excellence of its cattle.

For many years previous to 1860 Breadalbane was acknowledged to be well ahead of all competitors. The cattle were of splendid size and bone, remarkably free from coarseness, soft

and rich in their hair, and the cows, which were nearly all through very good milkers, had noble heads, the sweep of horn in many cases being most majestic. One or two strains in the herd were rather long, strong, and full below the eye, still the cattle as a group commanded the enthusiastic admiration of the best judges. The herd was founded about 1830 with the finest blood obtainable in the county. Some excellent females were obtained from Chesthill, and two very fine bulls were bought from a famous breeder and judge—the late Mr John Anderson, Braes of Foss. The second of these bulls came out as a Highland Society winner. For many years the Marquis also kept an excellent herd at Luing, and interchange of bulls between the two breeding-grounds was carried on with a rare amount of judgment. The sale of the Taymouth cattle in 1863, the purchase of the largest and best lot by Duke George of Atholl, and the fine drafts taken by Poltalloch and the Duke of Hamilton, can only be noted in passing.

It may be interesting, however, to state that the late Mr John Stewart, Bochastle, who was not a buyer at the Taymouth dispersal, attended most perseveringly at many of the earlier Atholl spare-stock sales, and also purchased privately from Old Blair when he had an opportunity. Among Mr Stewart's purchases from Atholl were the bulls Glentilt (295) and Daibhidh Buidhe; a black Dubh Chiar cow, the ancestress of the Sgiathachs, and another black cow Mairi Dubh. But after he had worked up his own large herd to a high standard of excellence, handsome offers induced Mr John Stewart to sell a good many of his choicest to Mr James Duncan of Benmore. In one year nine three-year-old heifers, among them a black Nannie and a dun Sgiathach, went from Bochastle to Benmore, and along with them there went the famous bull Roderick Dubh (451). The purchase of Mr Duncan's cattle in 1887 by Mr Valentine Smith of Ardtornish was the most important "Highland" event of its time.

The best bull at the Highland Show of 1857 was the three-year-old Calum Dubh of Poltalloch (76), shown by Mr R. D. Campbell of Jura, and bred by Mr Neil Campbell from Mhaldag, a cow of the Ribhinn family by the Luskintyre bull Prince Charlie II., which again was of the Guanach strain.

At Perth Highland Show in 1861 a famous bull appeared in the aged class, this being the Marquis of Breadalbane's five-year-old brindle Duntroon (177), sire of the great bull Donull Ruadh (144), the potent force at the base of the Atholl herd.

Passing into the Poltalloch herd, Duntroon took first and gold medal for Mr Malcolm at the Battersea International Show of 1862, and along with two other Perthshire-bred bulls—Glen-

lyon (290) and Crinan of Poltalloch (124)—he proved of immense influence in the noted Argyllshire herd. Stock by these bulls came out well in substance, and the eastern impression was strengthened in after-years by the purchase of the Atholl-bred bulls, Gille Dubh (250) and the champion Calum Riabhach (82). A notable stock bull, also in Mr Malcolm's herd, was Fear-a-Bhaile of Ormaig (204), which brought in Duntulm and Monachyle blood with marked effect. One of the most characteristic cows left at Poltalloch by the Ormaig bull was the wide-framed robust-looking Mhaldag (64) (fig. 26),

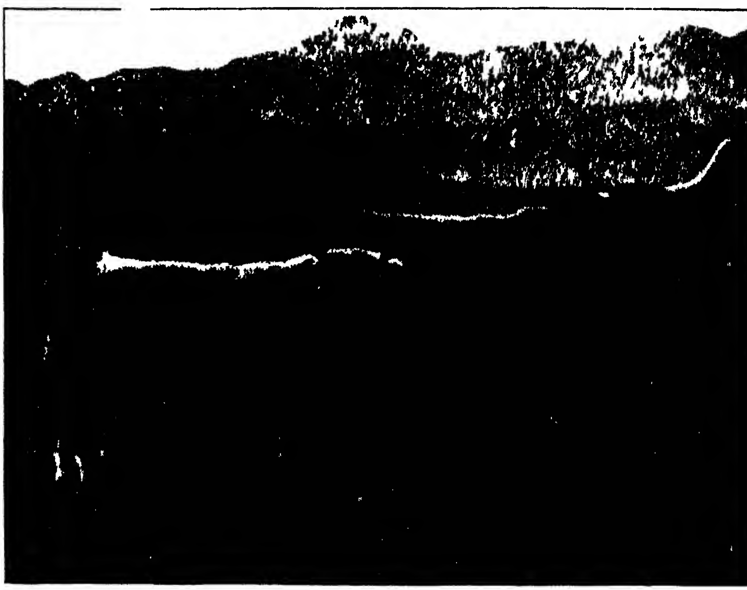


Fig. 26 —Highland Cow, "Mhaldag" (64).
Bred by Mr John Malcolm of Poltalloch. Winner of First Prize at Dumfries Highland Show, 1886

which won at Dumfries in 1886 as a five-year-old against the Ensay cows Ribhinn Lurach and Donnach Riabhach.

Crinan, a sappy, good-sized yellow—one of the best sires ever used at Poltalloch—was bred by the late Mr John M'Laren at Monzie, Blair Atholl, in 1858, and took first and special for Mr Malcolm at Kelso Highland Show in 1863. At that show Poltalloch had first in the younger class of heifers with a magnificent red—Molachag I. (540), bred at Taymouth and sired by Duntroon.

At Stirling Highland Show in the following year Molachag led the three-year-olds, and at Glasgow in 1867 she headed a

grand class of cows, her stiffest opponents being the Breadalbane-bred Proiseag Odhar and Mhaigdean I. (530), from Atholl and Poltalloch respectively. Mhaigdean steadily improved with age, and appearing as a five-year-old at Aberdeen, she took the place of honour in a fine class of cows, the third prize-winner that day being the Duke of Atholl's Mairi Dubh, afterwards sold to Bochastle. At the Aberdeen Show Mr Malcolm was also fortunate in the aged bull class with the four-year-old red Oscar (399), a son of Crinan, out of the Taymouth Jess, by Duntroon. A year later Molachag crowned an unbroken career of success by taking the medium gold medal at Edinburgh.

Reverting again to the Kelso Highland Show of 1863, we find that the Duke of Atholl then exhibited and took first prizes with three Breadalbane-bred animals, the equals of which have not probably been shown since that time by one man at any Highland fixture. The animals were the two-year-old Donull Ruadh (144), of the Fasaidh or Fassie family—one of the best at Breadalbane—the six-year-old red cow Rosie I., by Donull Odhar, and the dun three-year-old Queen I., by the same sire, and member of a strain held in supreme favour at Taymouth.

Taken all round, Donull Ruadh was one of the finest Highland bulls ever bred, for he was at once a show animal of the front rank and a magnificent success as a stock-getter. In 1864 he took first prize as a three-year-old; in the following year he won in the aged class, and carried the special prize as best bull on the ground. For three years in succession he then appeared and took the medium gold medal, being latterly in the possession of the Hon. Lady Menzies, Rannoch Lodge. It is to be regretted that a portrait of this great bull is not now to be had.

Donull Ruadh's most distinguished son at Old Blair was the red Fear-a-Bhaile (199), which was out of the picturesque yellow cow Lili, a daughter of Donull Odhar, with soft flowing hair and back-swirling horn. As a show bull Fear-a-Bhaile had perhaps a slight advantage over his sire. Judged by the old Taymouth standard, he was not the biggest of bulls; but he weighed well, and was practically perfect for symmetry, style, and hair. Like his sire, he had a clean record at the Highland Shows, and might indeed have been champion as a three-year-old; but the judges of those days always liked to keep the supreme honour of the day for the aged class.

Fear-a-Bhaile's turn came in 1869, when, as a four-year-old, he led the aged class at the Edinburgh Highland Show. Sold to the Earl of Seafield, he became the sire of some grand females, such as Bynach Ruadh (685), the first prize three-year-old at Edinburgh in 1877; Countess II. (686), the winning cow at Dumfries in 1878; and Dulnan (687), the leading cow at Kelso

in 1880. He also left a number of very good bulls, among these being Wallace II. of Seafield (549), the red which won at the Aberdeen Highland Show of 1876 in the aged class.

Two notable exhibitors came strongly to the front during the 'Sixties. These were Mr John Stewart, Duntulm (afterwards of Ensay), and Mr Robert Peter, Urlar. Mr Donald M'Laren, Corrychrone, was also a prominent winner in those years, but especially towards the end of the period referred to, with fine handsome cattle. Mr Stewart's most famous animal, upon the whole, in the course of the 'Sixties, was the grand big wide-headed Targeal Riabhach (799), which won as a three-year-old heifer at Glasgow in 1867, and as a cow at Edinburgh in 1869. Targeal was a most characteristic cow, and a true breeder. Her sire, the black bull Lord Macdonald (345), did great good at Duntulm. Mr Peter's beautiful cattle were much admired by genuine stockmen of every degree who chanced to have spare hours while on a visit to the charming neighbourhood of Aberfeldy and Taymouth. Some of his best cattle were closely related to the Taymouth and Chesthill strains. One of Mr M'Laren's most noted animals was his beautiful yellow cow which won the first prize at the Perth Highland Show in 1861. This fine cow is represented in fig. 25, reproduced for Stephens' 'Book of the Farm' from Gourlay Steell's painting in the Hall of the Highland and Agricultural Society.

Many famous animals ran their course in the 'Seventies. The Perth Highland Show of 1871 was a very strong one all round. Fear-a-Bhaile of Atholl, shown from Castle Grant, Targeal Riabhach of Ensay, and Ribhinn III. of Poltalloch, were on the ground for medium gold medals; Mr John Stewart, Duntulm, led in the aged class of bulls and took the special prize with the brindle Sgiathanach Og (491), by the black bull Geobach (220); Mr John Malcolm had the best of it in the two-year-old class of bulls with Duntulm Og (182), a grandson of Geobach out of the Breadalbane-bred Jessie (523), by Duntroon; the Duke of Atholl had the lead in cows with Young Queen, winner of first in the two-year-old heifer class at Aberdeen in 1868, and daughter of the Breadalbane-bred Queen I. already noted; Mr Malcolm won in the heifer classes, his three-year-old, Bealach (469), being a splendid dun, by Crinan, out of the show cow Mhaigdean.

Among the famous bulls shown during the 1873-79 period were the Duke of Atholl's Sgiathanach (489), bred at Duntulm, the Duntulm An-T-Eilanach (12), and Prionnsa Tearlach II. (427); Mr James Duncan's Bochastle-bred Donnacha Ban Nan Oran (155) (fig. 27), and the Duke of Atholl's Calum Riabhach (82); and among the females one might note the Bochastle N'Odhar, grand-dam of Proiseag Dubh (783), Riabhach Mho-

lach, from the same herd; the Duke of Atholl's pretty yellow cow Buidheag, and Te Ruadh Mhor; and a most remarkable succession from Duntulm—Targeal Beag (797), Ribhinn Lurach (1304) (fig. 28), and Guanach III. (789).

Sgiathanach made his first appearance as a two-year-old at the Stirling Highland Show of 1873, when he was placed second to the Urlar bull Gille Dubh (161), but the famous Duntulm-bred brindle led easily the following year at Inverness, and would have been very ill to beat when four and five years old. He was a somewhat dark brindle, of good size, with a handsome head, fairly clean neck, and well-balanced body set on short substantial legs, and he had the indefinable "something" which takes the eye of a judge who is on the outlook for a stock bull. His most famous son in the Atholl herd was Calum Riabhach (fig. 29), and he left a magnificent lot of females, such as Te Riabhach (35), probably the widest-headed cow calved within the memory of any show-goer; Rosie III. (34); Donnag; Donnag II. (26); Donnag Og (27); and N'Odhar Mhor, all cows of great scale and the grandest breeding properties. After being several seasons at Old Blair, Sgiathanach was acquired by Mr Duncan M'Diarmid, who used him with great effect at Camusericht. All in all, he was probably the best breeding bull of his time, and it is to be regretted that his full pedigree was not put on record for the first volume of the Herd-Book. Mr D. A. Stewart states that he was by Ludan Og (346) and out of Donnach Faidach by Lord Macdonald (345), granddam Donnach Dubh by Broken Horn, a Monachyle bull. As the dams of Ludan Og and Lord Macdonald were by Broken Horn, it will be seen that Sgiathanach was strongly inbred to Monachyle blood. The extent and form of the inbreeding account for the striking impressiveness of the bull when put to cows of old Perthshire strains.

An-T-Eilanach (12), a brindle with an unbeaten career, had a very considerable reputation in his time as a show bull. He was by Sgiathanach Og, already referred to, and his dam Guanach Og was by Duntulm Riabhach (183), a son of Geobach (220). Prionnsa Tearlach II., the leading two-year-old and three-year-old of his time, was of the Donnach family, and through his sire Rob Roy (440), the winning aged bull at Edinburgh Highland Show in 1877, he was related to Sgiathanach Og. Prionnsa Tearlach II. was a first-class stock bull, his females being of conspicuous merit. He is not to be confounded with the Poltalloch-bred red Prionnsa Tearlach (426), some time the property of Mr Archibald Turner, Kilchamaig, and afterwards a splendid success in the fine herd of the late Duke of Sutherland. That bull was of the Ribhinn family, and by Gille Dubh of Atholl (250).

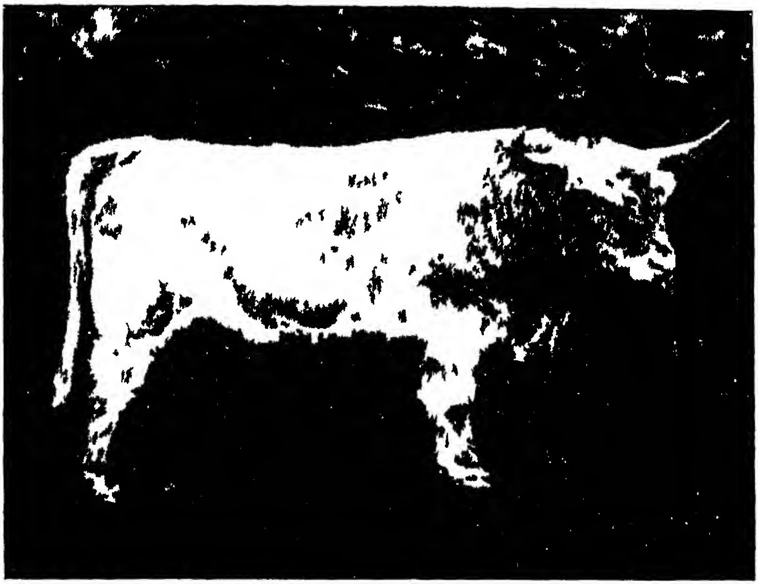


Fig 27 —HIGHLAND BULL, "DONNACHA BAN NAN ORAN" (155)
Bred by the late Mr John Stewart, Bochastle

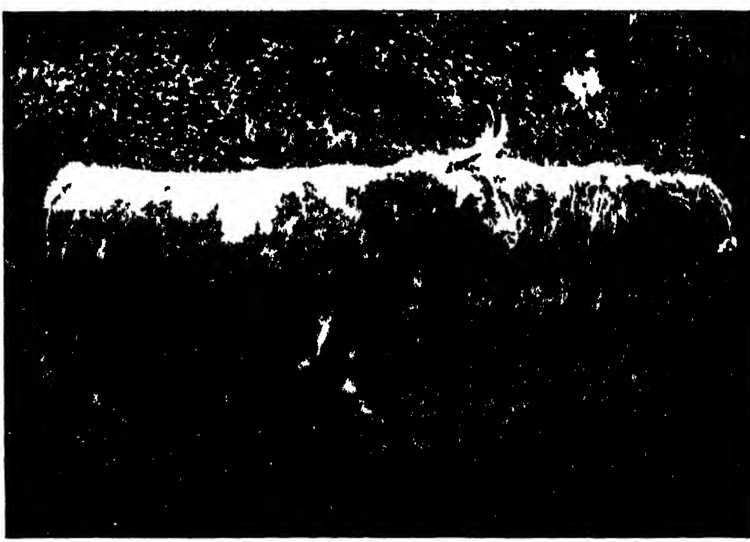


Fig 28 —"RIBHINN LURACH" (1304) AND BULL CALF
Bred by the late Mr John Stewart of Ensay Latterly the property of Mr T T Townley Parker

Donnacha Ban had the poetic "Nan Oran" added to his name after he left Bochastle, in honour, one supposes, of the untutored Celtic genius Duncan Ban M'Intyre, the composer of many an *oran* or song still of potency in the West Highlands. Donnacha Ban, a light dun in colour, had well-set horns of great quality, a beautiful brow, with soft hair hanging like a sporran. His general shapes were good, and he stood straight on strong legs; but he was not specially deep in rib. Mr James Duncan won with him in the two-year-old class of 1877, where Calum Riabhach stood third; but at Perth two years later Donnacha Ban had to stand second to the Atholl bull. Still undaunted, Mr Duncan sent his light dun to Kelso in 1880, where he won first and special prizes. As a breeding bull Donnacha Ban gave the Benmore herd an immense lift. His cows and heifers were well entitled to the epithet of *crodh boidheach* (beautiful cattle), and they bred remarkably, as Benmore and Ardtornish prize-lists can bear witness.

Calum Riabhach of Atholl took some time in coming to his best. He was a grandson of Queen I., being out of Nancy, a fine cow by Oscar, a son of Donull Ruadh, and was built on a large massive scale. He had a noble masculine countenance, a long, deep, and wide frame, sappy skin, and bones of the real old Breadalbane model, and for all his size and weight he carried himself until well up in years with a springy step. His footprints could be followed with ease on a muddy road. It was a case of Calum Riabhach—his mark. His neck was not so clean as a modern judge would wish, still he was a majestic-looking bull. He was somewhat sparingly used at Old Blair, as most of the cows were rather closely related to him; but his full opportunity came at Poltalloch, where he specially distinguished himself as the sire of many big and true breeding females. On his own calf-ground he left the noted Calum Odhar (79), a son of Young Queen, and grandson of Queen I. of Taymouth; at Rossie Priory, the famous brindle bull Rossie (456); and at Poltalloch, the prize bull Iain Challum (667), the lengthy heavy brindle of the Ribhinn family, which afterwards bred some very fine cows at Kinnaird Castle, among the rest Luna (2297), the dam of Duke of Leon (1232), the winning yearling at the Perth Highland Show of 1896.

Coming to the females already noted in a group, Targeal Beag (797) by Quirang (430) was one of the best-known daughters of Targeal Riabhach (799), as she took first prize as a yearling, two-year-old, and three-year-old; but she was not a breeder's animal like Ribhinn Lurach (1304), nor did she finish so well as the black Guanach III. (789), which won in the heifer classes of 1879-80, and afterwards as a cow in 1883.

In the early 'Eighties, down to the year of the Edinburgh

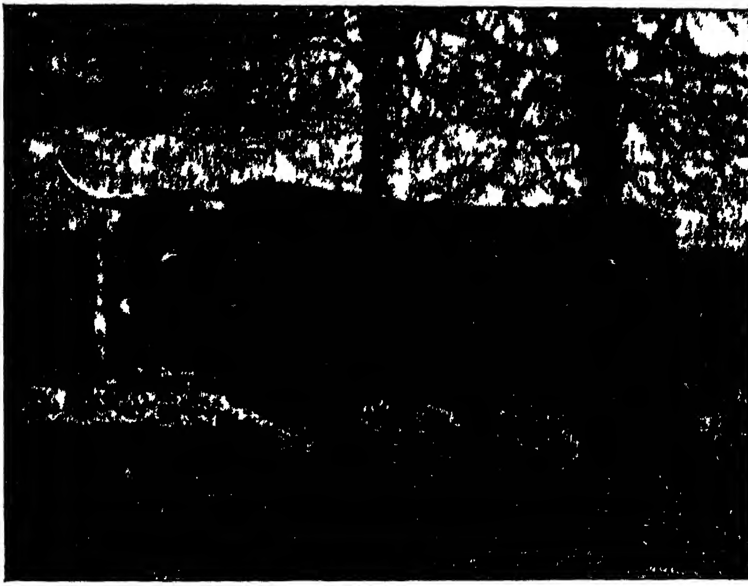


Fig 29 —Highland Bull, "Calum Riabhach of Atholl" (82)
Bred by the Duke of Atholl K T

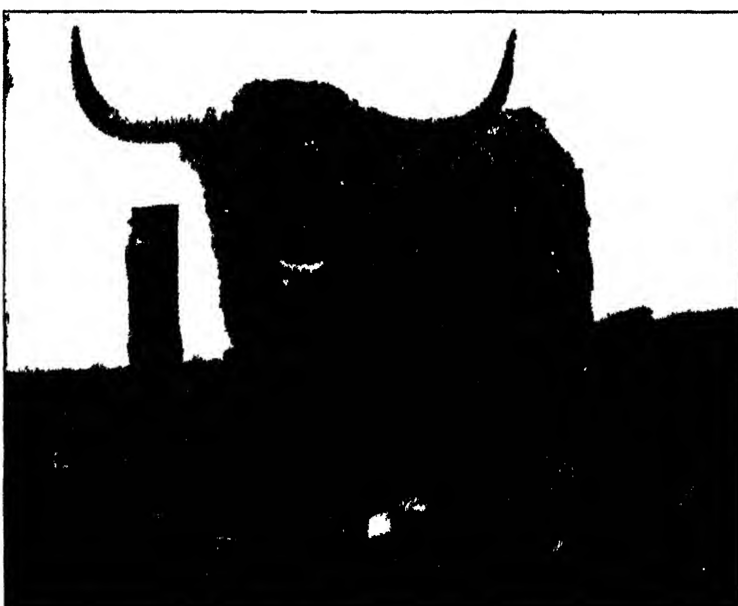


Fig 30 —Highland Bull, "Rob Roy III" (442)
Bred by the late Mr Donald M Laren, Corrychrone, Callander

Centenary Show, some famous animals appeared before the judges. Prominent among the bulls were Mr Duncan M'Diarmid's very prettily built and stylish brindle Ailpean (4), of Atholl breeding, winner of first and special prizes in the aged class at Stirling; the same exhibitor's handsome and most successful-breeding bull, the brindle Fear-a-Bhaile of Camusericht (200); Mr John Malcolm's Calum Riabhach of Atholl (82); Rob Roy III. (442) (fig. 30), to be afterwards noted and generally known as Rob Roy of Sutherland, because he was most of his days in the Shinness herd; the Duke of Atholl's Calum Odhar (79); and Lord Dunmore's An-T-Iasgair (13) (fig. 31), sometimes better known under his English name of The Fisherman.

The most noted of the females were the Duke of Atholl's Rosie III. (34); the Bochastle Proiseag Dubh (783) (fig. 32); and Annag Bhuidhe (780); and the Ensay Guanach III. (789) and Guanach V. (791). Mr M'Diarmid's Ailpean was by Tormaid Og (535), the second prize two-year-old at Kelso in 1872—not Tormaid as entered in the Herd-Book—while his dam was the Taymouth Jessie by Donull Ruadh (144), and his grand-dam Annag by Donull Odhar. Fear-a-Bhaile of Camusericht, the leading aged bull and champion at Inverness in 1883, was by Sgiathanach (489) out of the same dam as Tormaig Og just referred to. Fear-a-Bhaile did extremely well as a stock bull at Camusericht, Bochastle, Gordon Hall, and Garbole. The Garbole-bred brindle, Calum Riabhach, which won in the yearling class at the Oban Spring Show of 1899, is out of a Fear-a-Bhaile cow. That young bull now in the Taymouth herd also possesses two strains of Sgiathanach (489) blood through his sire, Fear-a-Bhaile of Moyhall (1354).

Rob Roy III. (fig. 30), the famous red bred by the late Mr Donald M'Laren, Corrychrone, Callander, owed his reputation to a unique grandeur in form and carriage. Some judges considered his head rather "strong"; but when a four-year-old his marked individuality in swirl of horn attracted attention, while his strength of frame, mellow hair, and good bone were much admired. After the four-year-old stage his horns took a somewhat wild upward curve, which few judges professed to like.

At the Stirling Highland Show of 1881 he was brought out by Mr Peter M'Martin, Liangarstan, Luib, and took second prize in the three-year-old class, the winner being Fear-a-Bhaile of Duntulm (201), whose sire, strange to say, was Rob Roy (400), the leading aged bull at Edinburgh in 1877.

At the Glasgow Highland Show in 1882 Mr A. D. Anderson of Ardsheal showed Rob Roy III. in the aged class, where he won handsomely, and took the special prize. The bull next appeared from Shinness at the Edinburgh Centenary Show, and

Fig 31.—An T Iasgair (13)
Bred by the Earl of Dunmore and latterly the property of the Earl of Southesk K.T

Fig 32.—Highland Cow, "Proiseag Dubh of Bochastle" (763), and Bull Calf, 'Black Prince' (45)
Bred by the late Mr John Stewart

was beaten by Mr Malcolm's Calum Riabhach of Atholl (82), the champion male of that day. Shown once more at Glasgow in 1888 when a ten-year-old, he had to give way to the half-brothers Rossie (456) and Calum Odhar (79). Rob Roy III. did not prove a specially successful stock bull, and examination of his pedigree does not throw much light on the matter. His sire Duke of Atholl (581), used most effectively in later years at Ensay, was by Sgiathanach out of a daughter of the Donull Ruadh cow Jessie of Taymouth, and his dam Dubh Mholach by the excellent bull Glentilt (295)—a son of Donull Ruadh from the Taymouth Rosie—came of very good Bochastle stock, but she was not a reliable breeder. The best male descendant of Rob Roy III. was his grandson Lord of the Isles II. (781) by the rather low-horned black bull Glen Dubh (662).

Calum Odhar, the winner of first prize and second cup as a three-year-old at the Centenary Show, and of first prize at Aberdeen the following year, was a bull of great scale and splendid bone. He had extraordinarily good back and ribs, very long, even, and deep quarters, and although his horns might have been a trifle bolder in set, they were of excellent quality, while his brow and muzzle were practically perfect. His one fault was a rather loose neck; still he was a grand, sappy bull. Being inbred to the Queen family—his grand-dam being also grand-dam of his sire—and otherwise pretty closely related to most of the cows at Old Blair, he was not much used there, and is now represented in the herd only by the great cow Te Bhuidhe (1379). In his later years he bred first-class stock in the herd of Mr Stephens, M.P. As The Fisherman's reputation is concerned with a more recent period, his breeding and general qualities will be noted in another paragraph.

Of the cows in the early 'Eighties group, Rosie III. of Atholl (34) stood out as one of the grandest of her sex seen for many a long year. A red of large, deep, square frame, straight above and below, she had a fine head with horn of perfect quality, and although she had a natural dock ear, a long fringe hanging from it went far to make compensation. Her set of hind-leg was a model, and she could not stand wrong. Sired by Sgiathanach, she was out of Rosie II., a daughter of Donull Ruadh of Breadalbane. At the Stirling Highland Show of 1881 Rosie III. appeared as a six-year-old, and led a very fine class of cows. Again, at the Centenary Show, she was put into leading position and had the second cup, the judges after some hesitation giving the preference for first cup to the winning three-year-old heifer, Guanach V. of Ensay.

Proiseag Dubh of Bochastle (fig. 32), which took third and second positions when the Atholl cow had the first prizes, came out at the head of the cow class at Glasgow in 1882, and at

Aberdeen three years later. Her showyard career had a brilliant finish when, as a twelve-year-old, and the property of Mr Valentine Smith, she took the Earl of Southesk's cup for best female. Proiseag Dubh's head, face, and back-swirling horns were strikingly sweet and of intense Highland character; she was full of quality, and had exceptionally good hind-quarters. Her one weakness was a comparative narrowness of chest, a fault which she transmitted in a measure to one son, Black Prince (45), and in rather pronounced form to another, Victor V. Her sire and dam, Roderick Dubh and Proiseag Bhuidhe, were two of the best animals which passed from Bochastle to Benmore.

Guanach V. of Ensay, the winning two-year-old of 1883 and champion female of the Centenary Show, was certainly a beautiful heifer when she appeared at Edinburgh. A brindle in colour, she was by Fear-a-Bhaile of Duntulm (201), and her grand-dam was Guanach Lachin (792), the fine black by Duntulm Riabhach (183) which led in the cow class at Kelso in 1872.

The most notable bulls associated with the shows of the late 'Eighties were the Duke of Atholl's Rossie (456) and the Ensay Ceatharnach (642), while the greatest of the females without question was the Duke of Sutherland's Tarrgheal (1324) by Prionnsa Tearlach (426), although Mr Valentine Smith's Sgiathach Dubh (1251) (fig. 33), Mr John Malcolm's Ealasaid (1128), and the Duke of Atholl's Te Bhuidhe (1379) were far out of the ordinary rank. Rossie, which was calved in 1883 at Rossie Priory, was from a dam of an Urlar family, tracing back to Glenlyon stock. Like his sire Calum Riabhach, he steadily improved until he was over five years old, and was then a bull of great sweetness and style, with beautifully set, if rather fine, horn, clean neck, and excellent hind-quarters. He wanted spring of fore-rib to some extent, but he proved an admirable breeding bull. At Glasgow, in 1888, he won clearly enough against his half-brother Calum Odhar and Rob Roy III., and his stock at Atholl, Taymouth, and Dall—where he ended his days—have been of very great all-round merit as individual specimens and as breeders. His most noted sons were the full-brothers Donull Riabhach (875) and Adhollach (960), both first-prize winners at Oban in the aged class—the former a most successful stock bull at Shinness and Ardtornish; Duke of Berwick (877), used with excellent effect at Kinnaird Castle; and Blair Atholl (979), a good breeder in the West Highlands.

In looking up the pedigree of Donull Riabhach or Adhollach the searcher after "Highland" facts may note that Beauty of Atholl (21), granddaughter of Nancy, the dam of Calum Riabhach, was by Broken Horn, a first-class stock bull of the Dubh Chiar family, which is entered in the Herd-Book as Gille Ruadh (277).

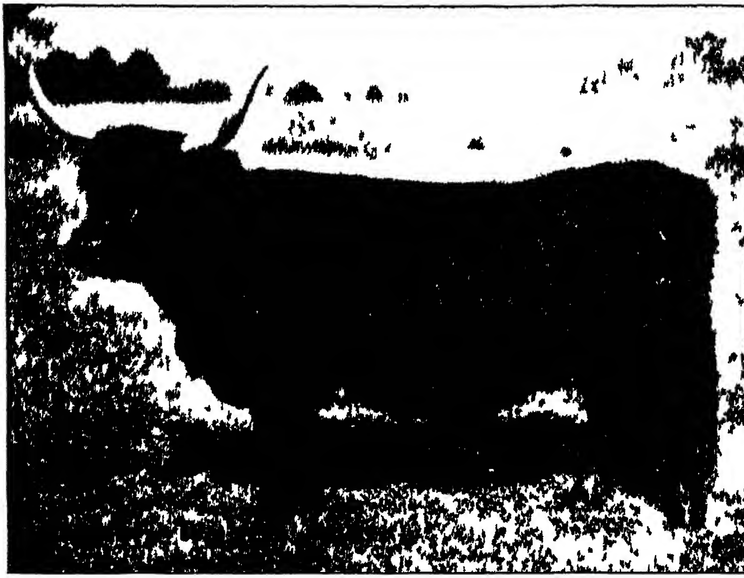


Fig 33 —HIGHLAND COW, "SGIATHACH DUBH OF ARDTORNISH" (1251)
Dam and grand dam of several first prize and champion animals Bred by Mr James Duncan of Benmore

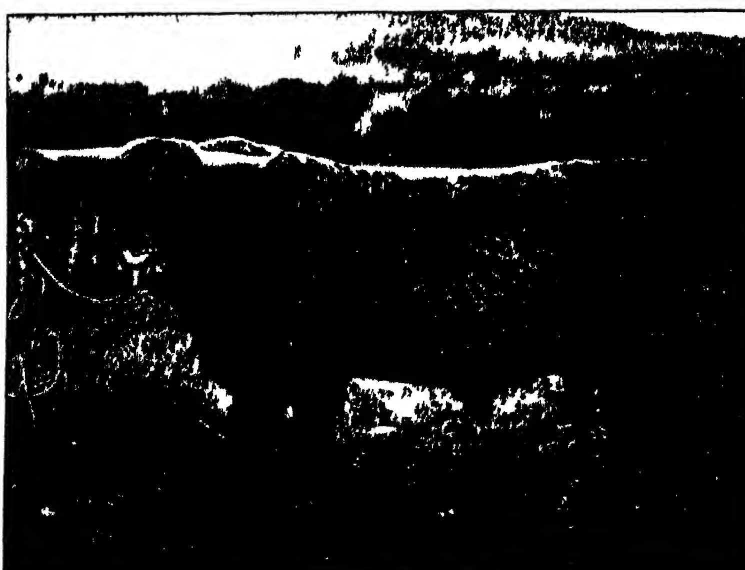


Fig 34 —CEATHARNACH BUIDHE (719)
Bred by the late Mr John Stewart of Ensay and Champion Male of the Breed in 1891 and 1892
Afterwards property of the Earl of Southesk K T, and Mr H C Stephens, M P

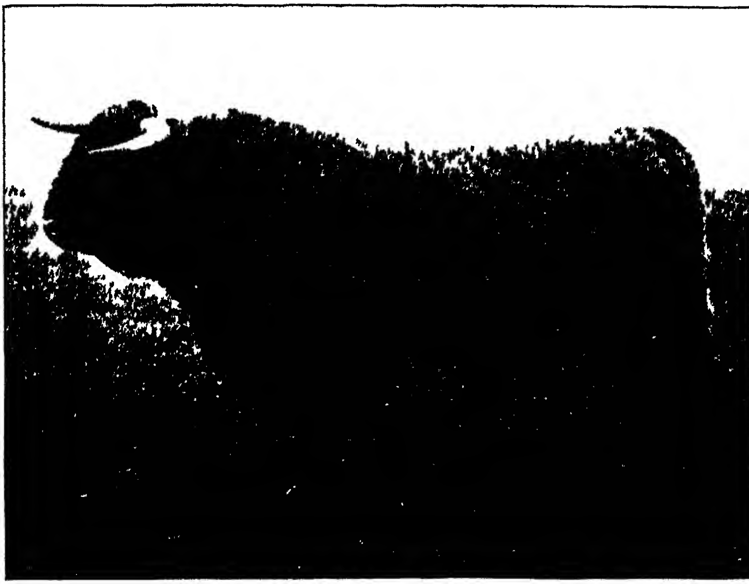


Fig. 35.—Highland Bull, "Laoigh" (1260).
Breed Champion, 1896-97. Bred by the late Mr John Stewart of Ensay Property of the Earl of Southesk, K.T.

Fig. 36.—Highland Bull, "Victor V." (951).
First Prize Winner, 1893 Bred by Mr T. Valentine Smith of Ardtornish

Ceatharnach made his first showyard appearance as a two-year-old at Glasgow in 1888, where he won easily. He was a pretty bull that day, and looked well as leader of the aged class and winner of special prize in the following year. Although a very fine bull, with a bold handsome countenance and robust well-knit frame, he lacked something in quality, and upon the whole he was not an outstanding success as a breeder on his home grounds or at Ardtornish, Poltalloch, and Cholderton. Yet his blood was the very best, his sire having been Young Prince Charlie (557), a son of the excellent bull Prionnsa Tearlach II. (427), and his dam Guanach V. of Ensay (791), the Centenary champion female. His far-famed son Ceatharnach Buidhe (719) (fig. 34), a perfect representation of lordly Highland grandeur when looking one straight in the face, and a bull of great massiveness though somewhat slack-waisted and wanting in filling out from hip to plate, has vastly strengthened the Ceatharnach reputation; but the yellow has owed much to his dam—Ribhinn Og of Ensay (795) by Prionnsa Tearlach II. (427), and something to his grand-dam Ribhinn Lurach.

The greatest Highlander of the line, however, is Ceatharnach Buidhe's son Laoich (1260) (fig. 35), a bull built on the large scale of other days, wanting his sire's nobility of countenance, yet easily his superior in general conformation, the cleanness and taper of neck, depth from shoulder top to floor of the chest, heart-girth, length of frame, balance of parts and quality being altogether extraordinary. Here again there is concentration of blood, his dam being the grand massive cow Shellay III. (2351) by Morair (681), a light brindle son of Prionnsa Tearlach II., and there is further a double cross of Rob Roy (440).

Passing from the majestic to the compact and strongly characteristic, one comes to The Fisherman, a bull which might have passed away with an ordinary reputation had he been steadily put to the smaller strains of western cows. Ardtornish brought him into special prominence, and the best of his stock there were the splendid heifer Sgiathach IV. (2276)—the broken-horn female champion of 1891-92—the first-prize yellow cow Proiseag IV. (2275), and the compact brindle bull Victor VII. out of Proiseag Dubh, and male champion at Edinburgh in 1893. At Kinnaird Castle The Fisherman left some pretty bulls, as the Oban records can testify, and any of his females retained are proving very true breeders. He himself was an out-and-out Hebridean, short in face, moderate in size, strongly jointed, and with extraordinary wealth of hair. Put to large open-framed cows unrelated to himself, he was a success, and his own conformation and breeding explain the matter. He was inbred to the Ensay Donnachs, his sire Seaforth II. (479) and his dam Donnach Buidhe by Troda (539)—a son of Sgiathanach

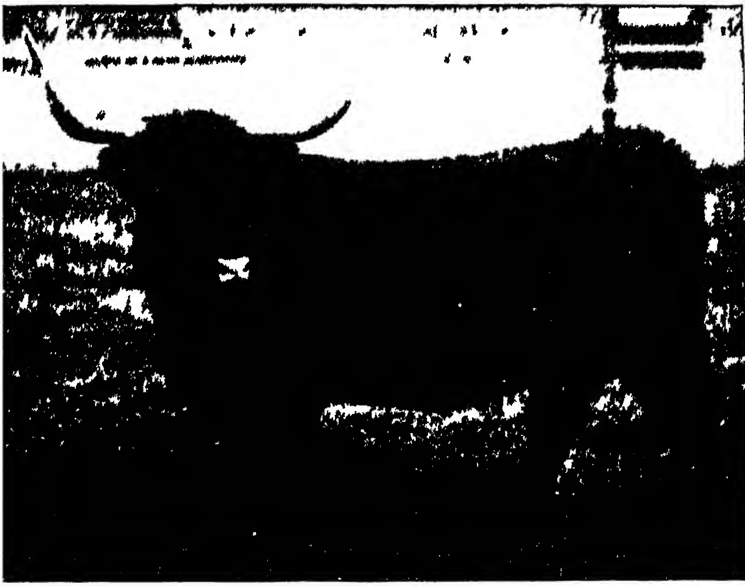


Fig 37 —Highland Cow, "Ruadh Mhor" (3274)
Poltalloch First Prize Cow 1893 Bred by the late Mr Keith M Lellan of Melfort

Fig 38 —Highland Bull, "Calum Riabhach II" (1325)
Breed Champion, 1898 99 Bred by the Duke of Atholl K T.

Og (491)—having for grand-dam Donnach Riabhach by Lord Macdonald (345).

Tarrgheal of Sutherland, the champion female of her time, was calved in 1884, and was a cow of marked robustness of frame and individuality of character. At her best she had extraordinarily good fore-quarters, and was more inclined to flesh than to milk. Tracing back to a once well-known Sutherland foundation, her grand-dam was by Tormaid Og (535), the sire of the first-prize bull Ailpean referred to in preceding notes.

The most remarkable prize-winning herd of the past ten years—that of Ardtornish—merits a special note. Of bulls like Victor (828), Victor V. (951) (fig. 36), the sire of the first, second, and third prize cows, and the second-prize aged bull at the last Highland Show; of the many excellent females apart from those already noted, such as Cruinneag II. (2921), Sgiathach II. (1730), and Sgiathach VI. (2929), one could say much without being merely wordy. Victor V. can scarcely be passed without a line. A son of Proiseag Dubh, he is entered in the Herd-Book as by the Bochastle Ailean Ruadh (626). As a three- and four-year-old he bore a striking resemblance to Proiseag Dubh's other son, Black Prince (45), by Fear-a-Bhaile of Camusericht (200), and his stock have run very persistently to the Proiseag character.

Of cows representing the old Taymouth stamp no finer specimens have been seen during the past decade than the Bochastle Mairi Bhuidhe (2321) by Black Prince (45), and the Atholl Te Bhuidhe (1379) by Calum Odhar (79), and dam of the full-brothers Calum Ban (1203) and the magnificent Edinburgh yearling Calum Buidhe. The facial imperfection and extraordinary merits otherwise of certain Breadalbane strains have not been more completely exemplified in recent years than in Ruadh Mhor of Melfort (3274) (fig. 37), member of the Poltalloch Ruadh Bheag family. A prettier or better-haired bull than Calum Riabhach II. (1325) (fig. 38), the champion of the past two years, and representative of the old Dubh Chiar family, has not perhaps been seen for a generation.

The writer is convinced that he has given but an imperfect review of famous Highland bulls and cows. Selection of typical animals everywhere, from showing and non-showing herds, would have been ideally complete; but the present method of looking at the noble breed mainly through its own "Highland" may be pardoned even by those who note that the oral records of many a glen and corrie have been left untouched.

It may be mentioned that most of the portraits here reproduced are from photographs, chiefly by Mr C. Reid, Wishaw, Mr Jackson, Perth, and Mr Paul Cameron, Pitlochry.

THE IDENTIFICATION OF TIMBER.

WITH A UNIFORM SERIES OF PHOTO-MICROGRAPHS.

By D. F. Mackenzie, F.S.I., Morton Hall, Liberton.

The identification of timber is a subject known only to experts, and although treated by one or two well-known writers, the subject is perhaps not sufficiently interesting for the general public. As such identification is one of the tests applied to students in forestry, it may not be out of place to show by illustrations the chief characteristics of many of the timbers used in the industries of the country.

The average forester has little or no difficulty in recognising the different kinds of trees he meets with in his daily occupation, but is frequently at a loss to know timber when he meets with it in the manufactured state; and a great many people know little or nothing of timber when it is manufactured. A joiner or carpenter using a limited number of sorts of woods can often tell the kind of wood he works by the general "figure" given to the wood by the medullary plates, usually called "silver grain," shown on all parts of most woods when cut at right angles to the yearly growth. The carpenter also judges by the weight, hardness, and colour. Cabinetmakers get over the difficulty by applying fictitious names to many of the timbers they use, the proper names being unknown to them.

For the architect, the clerk of works, factor, or forester, the identification of the various timbers should form one of the chief branches of their practical education. That most of these are entirely ignorant or only moderately acquainted, practically, with the natural appearance of woods is only too well known. The fact that so many articles are made, sold, and fitted up of timber different from specification, and also that stained woods of inferior quality take the place of superior and different wood, is sufficient evidence. Beech is passed off as the best rosewood, ebony, &c., and the poplars and willows as mahogany, butternut, and other high-priced woods. If people requiring timber had a fair knowledge of the characteristics that distinguished one class from another, these and other frauds could not be committed, and honest people would not be imposed upon.

As has been indicated, the ordinary forester has little difficulty in distinguishing most of our timber trees by their general external appearance—by leaf, bark, branches, buds, and characteristic outline belonging to each species in their various environment. So also the carpenter can recognise a limited

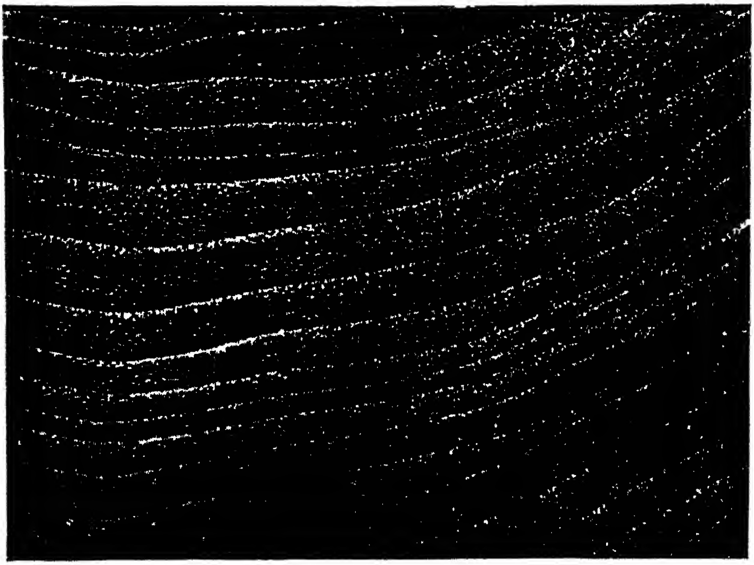


Fig. 39.—*The Common Elm* (transverse section, very slightly magnified).

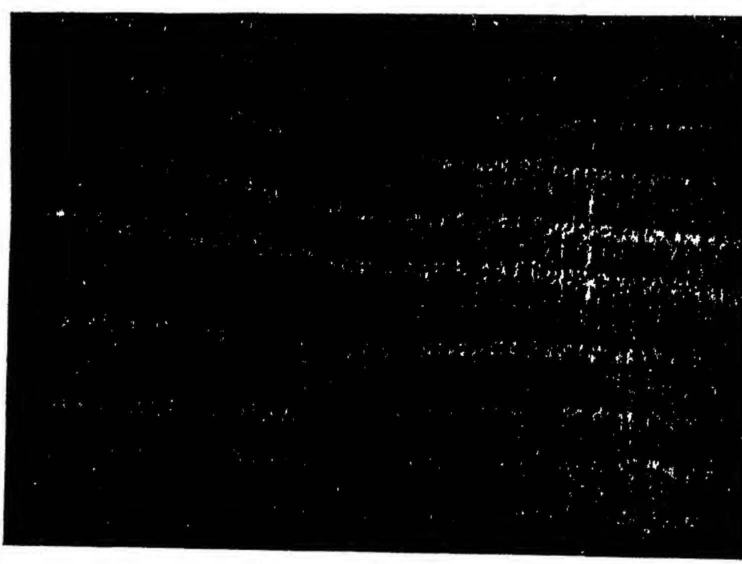


Fig. 40.—*The Oak* (transverse section, very slightly magnified).

number of woods, especially those he is in the habit of using constantly. He knows his woods by the "silver grain," colour, density, and other characteristics observable in them; but he very often mistakes the Spanish chestnut for what is called "mild oak." These characteristics are neither so precise nor are they so constant as to enable students or others to fix upon definitely and with certainty the order or family to which a given piece of timber belongs, because they vary with situation and climate. The timber of Scots fir, spruce, or silver fir, or indeed of any class of wood grown and properly matured in its natural habitat, appears to the ordinary observer quite different when grown under different conditions. Even soil, climate, and closeness of growth give a different appearance externally. The internal arrangements, however, are always constant to type. Close planting has a very beneficial effect in producing clean straight timber; but it has also the effect of changing most of the external characteristics, and to the superficial observer the internal characteristics also, so much so that the wood of a given tree in the manufactured state may readily be mistaken for that of another.

Something more, therefore, than the outward appearance presented by the individual tree or species is required in order to distinguish one variety from another. To be able to distinguish with certainty one piece of timber from another, a fair knowledge of the internal characteristics of the various "families" is required. One must know timber by the size, number, and arrangement of the pores or vasa, the sponginess or otherwise of the tissue, the size and number of the medullary rays or plates. In many the distinguishing features are medullary spots (fig. 68) or the number of tubes or cells in the medullary rays, or whether these are straight or curved from the heart to the bark, the wood of each species having quite a different plan of fixing or weaving up its fibrous tissue.

In order to be able to examine accurately the detail of any given piece of timber it is necessary to cut from a sound piece of wood a transverse, a longitudinal radial, and a longitudinal tangential section from $\frac{1}{50}$ to $\frac{1}{100}$ of an inch in thickness, or thin enough to enable one to see quite through any part of the tissue. It may be necessary to cut a few of each before a good specimen can be got. Dry the section well, remove the air from the cells by immersion in benzole, and place immediately between glasses with Canada balsam thinned down with chloroform. The section is then ready for examination and may be photographed. If the sections are not to be kept they should be dried and absolute alcohol should be taken as a medium, glycerine jelly being preferable if a lengthened examination is desired. Placed in either of these media, the structure is

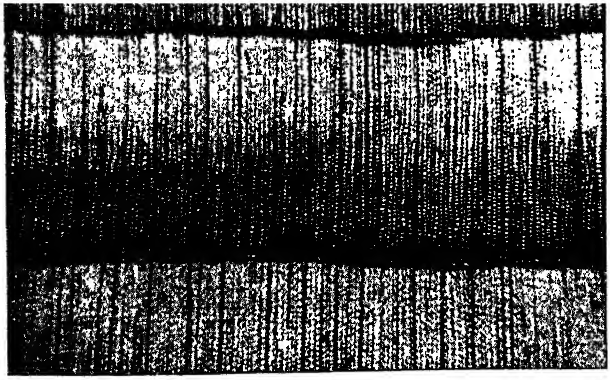


Fig. 41.—*Abies pectinata* (transverse section).

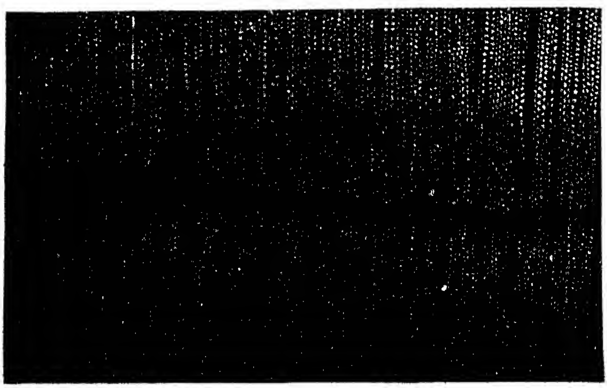


Fig. 42.—*Araucaria imbricata* (transverse section).

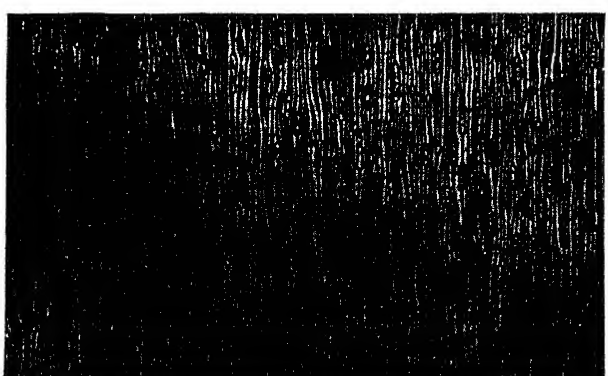


Fig. 43.—*Araucaria imbricata* (tangential section).

rendered visible by a very ordinary microscope. The transverse section will show in hardwoods or broad-leaved trees, vasa or pores, zones of yearly growth, and other characteristics. The longitudinal radial section will show the vascular bundles and the medullary rays in longitudinal section, and in many cases dotted tissue. The longitudinal tangential section will show the vascular bundles in detail, split up and divided by the medullary plates or rays, and also number and position of tubes or cells in the rays, also dotted or pitted tissue (figs. 85 and 88)

The same sections from pines will show in the transverse section of some the general tissue, resinous canals or pores, or in many of the species—such as the Abies, Cupressus, Biota, Oxycedrus, and Juniperus — the absence of these canals or pores. The radial section will exhibit the medullary cells or rays and tracheides, and in nearly all of the species the pitted cells with marginal borders (fig. 57). The tangential section will show the medullary rays and also the tracheides, and in some of the true pines resinous canals surrounded by medullary cells, as in fig. 47.

In some of the coniferous woods there are no visible pores in the woody tissue. In these there will be found very large canals in the inner layers of the bark. These, as a rule, exude large quantities of resinous matter—example, *Araucaria imbricata*. Some of the Taxads have resinous canals in the pith. The Salsburia has got two such pores in the pith but none in the wood. Each species has its own distinct characteristics In the pine the medullary plates are generally formed of single lines of cells (figs. 47 and 51). In some, however, the medullary plates range from one to three lines, always tapering towards the upper and lower edges (fig. 62). The tubes or cells forming the lines of plates or rays range from one or two in a plate to ten and sometimes even twenty in the pines, the plates of which are formed of a single line of cells, while those having more than one line in a plate or ray have up to one hundred.

The same characteristics are to be found in the hardwoods. In many of these the cells of the medullary rays are very numerous. Sometimes there are over a thousand in one plate (see *Lagetta lintearia*, fig. 85). In some the cells are much larger, as in the beech (fig. 81). In the *Lagetta lintearia* the " weaving "-like principle upon which the woody fabric is built is clearly shown. It will be observed from fig. 85 that the medullary plates split up the vascular bundles, dividing and compressing alternately.

In the Pine tribe the plates are smaller, more regular, and divide the tissue into smaller portions. This class of wood is therefore more easily rent or split. Resinous woods or pine timber is of the most simple structure, being formed of simple

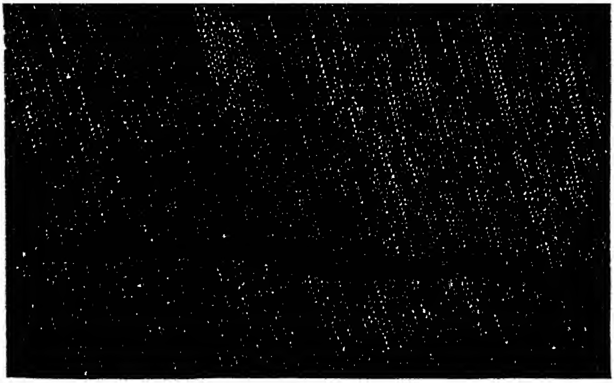


Fig 44.—*Biota chinensis* (tranverse section).

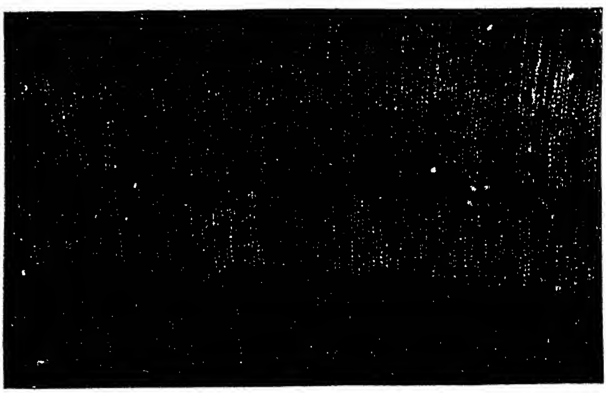


Fig. 45.—*Juniperus oxycedrus* (transverse section).

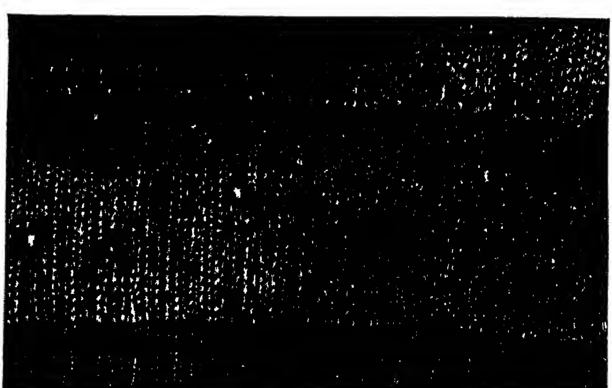


Fig. 46.—*Larix europea* (transverse section).

spindle-shaped tracheides, with or without visible resinous pores or canals. Where these do exist they are often found without any apparent order, but they sometimes follow a well-defined rule both as to number and disposition, always occupying the same position in the zone or year's growth of the different varieties. In some pines they are found in groups of twos or it may be threes in the autumn wood, as in *Pinus laricio.* In others they are in large numbers, from one to a hundred or more; also in the late autumn band, as in the *Wellingtonia gigantea.* In others, again, they are interspersed throughout some of the zones in both the summer and autumn growth, generally in groups of twos, as in *Larix europea.* In the *Picea excelsa* they are distributed irregularly throughout some of the zones, in other zones they are in lines in the spring wood. In *Cedrus Libani* the pores are usually in the early spring wood, and in lines of hundreds, but very inconstant, many of the zones having no visible pores. In all the coniferous woods the zones are rendered very distinct by the band of autumn wood, more or less dense. These are some of the chief characteristics of pine timber. Further details will be found in the description of the photo-micrographs.

The "hard" or leafy woods show their characteristics to better advantage. In most of these the zones are not so visible as in the coniferous wood, and the arrangement of the pores is almost absolutely constant. Here, too, the size and distribution of the vasa, as shown in the transverse section, is perhaps the principal characteristic of this class of wood, as also the medullary rays, and medullary spots found in some of the species. Take as examples the three elms—*Ulmus campestris, U. montana,* and *U. effusa.* It will be observed how similar and yet how different they are. Then take the ash (*Fraxinus excelsior*) and *Celtis australis.* They are nearly alike, yet quite different in the details. The Acers and Maples form another interesting group, also the Prunus and Pyrus or Sorbus—nearly alike but differing in detail.

In the leafy woods the zones are not so apparent as in the coniferous. This is owing to the equality of the tissue of both the spring and the autumn wood, and the tissue is not so simple as that of the Conifers, being composed of fibres and vessels or pores distributed throughout the zones. In some of the species, such as the Acers, these pores are nearly all of the same size, and are distributed equally throughout the whole year's growth. Where the one year's growth ends and the other begins is not visible to the unaided vision, as in *Acer campestris.* The same characteristic is found in the walnut (*Juglans nigra*). In some of the Oaks the beginning of the season's growth is indicated by one or more lines of large pores,

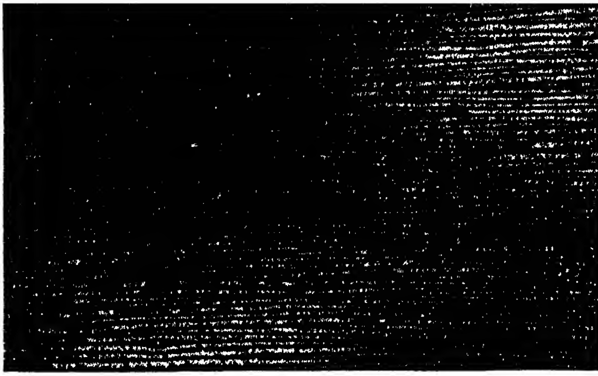


Fig 47 —*Larix europæa* (tangential section)

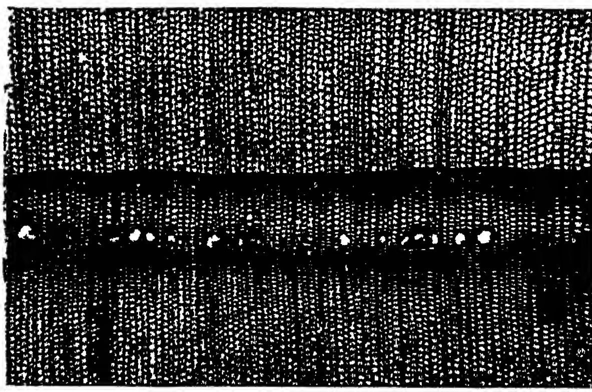


Fig 48 —*Picea excelsa* (transverse section)

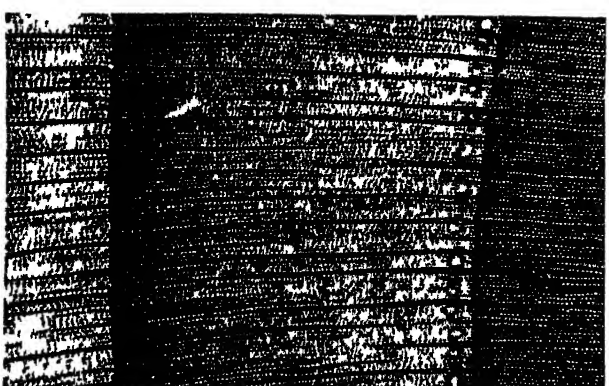


Fig. 49 —*Pinus cedrus* (*Libani*) (transverse section)

surrounded by tissue more loosely formed than the tissue of the rest of the zones, the pores gradually diminishing in size and number in the autumn growth. See *Quercus Ilex.*

On the other hand, a well-grown *Quercus suber* presents features the reverse of *Q. Ilex*, the pores and tissue being almost uniform throughout with a thin line of autumn wood indicating the zone. *Q. cerris* and *Q. alba* each present their own characteristics. Many of the "hard" or leafy woods show secondary circles of tissue less compact than the rest of the zone. This is a characteristic of the Oaks, and is shown in *Q. cerris* and others (fig. 101). It will be observed that the tissue lying immediately out from the circle of spring wood is more spongy than that inside. Some of the Oaks show small medullary spots.

The medullary spots (fig. 68) are characteristic of Prunus, Pyrus, Alnus, Salix, Populus, Betula, and others. These spots are often large, giving the wood a beautiful mottled appearance, though often almost invisible to the unaided eye. They are generally lying parallel to the zone or circle, sometimes in small spots throughout the tissue. They are composed of medullary cells packed or wedged into and displacing the ordinary tissue. They intercept the medullary rays, but these re-form on the outside. These "spots" cause the woods to split very easily. Their use is uncertain. They are probably an over-exuberance in the medulla. The latter appears to remain active longer in the varieties presenting these spots than in those that do not present any, or at all events those that do not present any visibly.

The description of the various photo-micrographs will explain fully the above limited details. In giving the description the writer adopts the method in use in the French and German school. They divide the medullary rays and pores or vasa in a very concise manner as follows:—

Medullary Rays.

Very large—those of the same category as the *Quercus Ilex.*
Large—those of the same category as the root of the Common Alder.
Medium large—those of the size of the Platanus or Plane.
Medium—those of the Acer or Maple.
Narrow—those of the Ash.
Very narrow—those of the root of the Birch.

Pores or Vasa.

Large pores—those of the same category as the Common Oak.
Medium large pores—those of the category of the Common or English Elm.

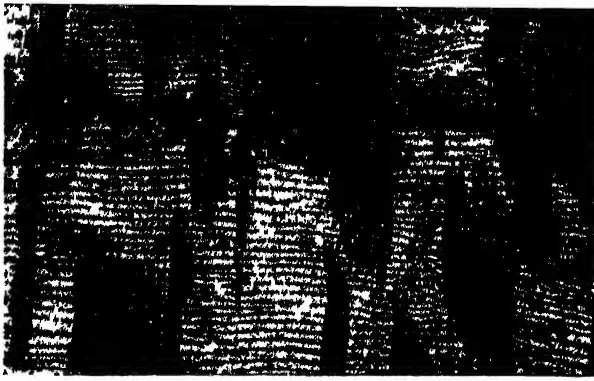


Fig. 50.—*Pinus cedrus* (*Libani*) (radial section)

Fig. 51.—*Pinus cedrus* (*Libani*) (tangential section).

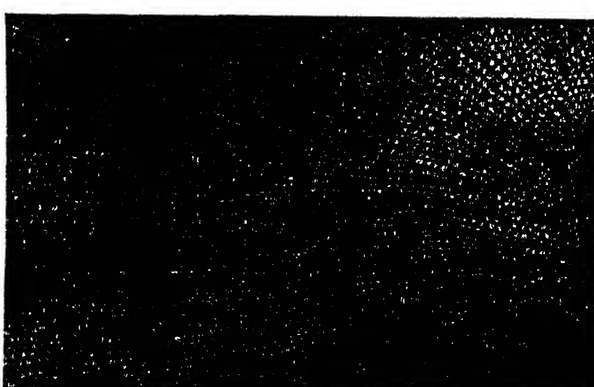


Fig. 52.—*Pinus cedrus* (*Libani, root*) (transverse section).

Medium pores—those of the category of the Whin.
Medium fine—those of the category of the Maple.
Very fine—those of the category of the Spindletree or of *Phillyrea stricta.*
Extremely fine—those of the category of the Holly.

To enable the reader to estimate the extent to which the tissue of the various sections is magnified, the photographs in figs. 39 and 40 will form the basis of comparison. These photographs are taken direct from the end of logs of the wood named, and are only very slightly magnified. Fig. 39 is taken from a fairly good example of the common elm, and fig. 40 from the oak, both transverse-section views. Unfortunately very few of our woods present features distinct enough to enable them to be photographed direct from the log, so that photo-micrography has to be resorted to in order to get sufficient detail to enable us to illustrate any piece of timber accurately.

The following is a short description of the individual photomicrographs on the lines indicated above, and the mark placed here—thus —represents the exact size of the piece of timber so photographed.

I. *Coniferous Woods.*

Fig. 41. Transverse section, *Abies pectinata.*—Medullary rays numerous, narrow, going in straight lines from the heart to the bark. No resinous pores. Zones ligneous, very apparent, well rounded. Wood moderately white, medium weight, rather soft.

Fig. 42. Transverse section, *Araucaria imbricata.*—Medullary rays narrow, numerous, sometimes in double lines in the plates. No resinous pores visible. Zones rather distinct. Tissue equal. Wood yellowish-white, medium weight, hard.

Fig. 43. Tangential section, *Araucaria imbricata.*—Shows arrangement and position, tracheides and medullary plates.

Fig. 44. Transverse section, *Biota chinensis.*—Similar to *Juniperus oxycedrus.* Tissue finer, wavy. Has little or no pigment in the tracheides.

Fig. 45. Transverse section, *Juniperus oxycedrus.*—Medullary rays numerous, very narrow, straight or slightly waving. No resinous pores. Here and there some cellules filled with reddish-brown pigment. Zone tracts marked, waved, and undulating towards the circumference. Heart yellowish-red. Hardness and weight medium.

Fig. 46. Transverse section, *Larix europea.*—Medullary rays pretty numerous, narrow, almost straight. Few resinous pores, small, isolated or in groups of twos and threes. When well grown tissue very close together on the outside on a large band of autumn wood, and consequently ligneous zones very apparent. In old trees these are waved. Heart reddish-purple. Sapwood yellow, moderately hard and heavy.

Fig. 47. Tangential section, *Larix europea.*—Exhibits medullary plates, resinous pores, and tracheides.

Fig. 48. Transverse section, *Picea excelsa.*—Medullary rays numerous, medium straight. Resinous pores small, few in number, irregularly dispersed, sometimes in lines, or isolated, and in twos and threes.

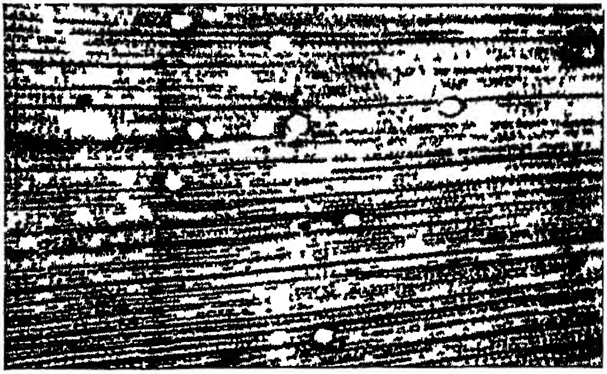


Fig 53 —*Pinus excelsa* (transverse section)

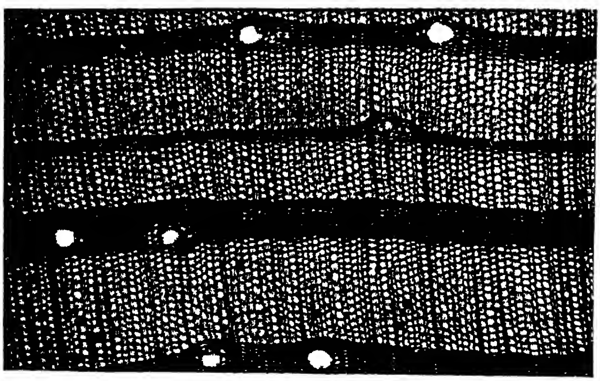


Fig 54 —*Pinus laricio* (transverse section)

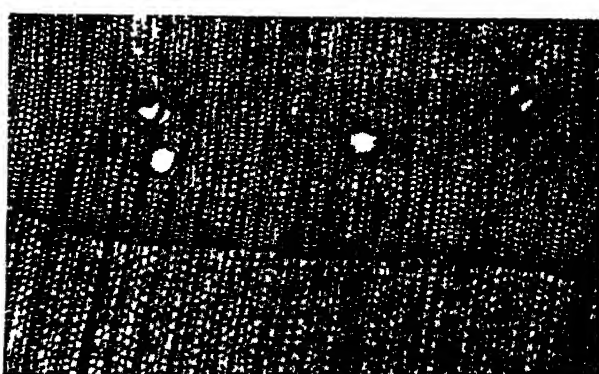


Fig 55 —*Pinus strobus* (transverse section)

Ligneous tracts very apparent, undulating. Wood white, rather light and soft.

Fig. 49. Transverse section, *Pinus cedrus* (*Cedrus Libani*).—Medullary rays numerous, small, slightly undulating. Resinous pores not very numerous, usually in continuous lines, and small. Ligneous tracts very distinct, regularly concentric. Wood very fine. Heart brownish-yellow. Sapwood white, moderately hard, and heavy.

Fig. 50. Radial section, *Pinus cedrus.*—Shows detail of medullary plates, dotted cells, and termination of season's growth.

Fig. 51. Tangential section, *Pinus cedrus.*—Showing end section of medullary rays and the weaving principle of these in the growth or tissue.

Fig. 52. Transverse section, *Root of Pine.*—Showing the arrangement of medullary rays and tissue.

Fig. 53. Transverse section, *Pinus excelsa.*—Medullary rays very fine, straight, and numerous. Resinous pores more numerous than in Strobus or Sylvestris. Wood very resinous, and consequently heavy. Colour yellowish-white.

Fig. 54. Transverse section, *Pinus laricio.*—Resembles very much *Pinus sylvestris.* Medullary rays rather larger, straight, and regular. Pores more constantly in twos, and usually more in the ligneous zones. Matured wood softer than *P. sylvestris*, but more durable. Heartwood faintly red. Sapwood yellowish-white. Wood heavy.

Fig. 55. Transverse section, *Pinus strobus.*—Medullary rays numerous, narrow, and straight. Resinous pores a little varied, rather numerous, average size, isolated or in twos and sometimes threes. Tissue rather irregular, crowded round the pores. Woody layer broadening imperceptibly towards the circumference, forming almost perfect circles. Heart yellowish-red. Sapwood white. Wood soft and light.

Fig. 56. Transverse section, *Pinus sylvestris.*—Medullary rays numerous, narrow, pretty straight. Resinous pores numerous, variable, almost medium, isolated here and there in twos. Tissue regular. Zones close together in a broad exterior band a little undulated. Heart reddish-yellow. Sapwood yellowish-white. When well grown wood heavy and tough.

Fig. 57. Radial section, *Pine.*—Shows the pitted cells with marginal border.

Fig. 58. Transverse section, *Salisburia adiantifolia.*—Tissue presents the same appearance as that of the yew or juniper. Has no resinous canals in the wood, has two such canals or pores in the pith. Medullary rays numerous, medium fine, often strong. Wood hard.

Fig. 59. Transverse section, *Taxus baccata.*—Medullary rays numerous, narrow, straight in the young tree, undulating in the older. No resinous pores. Tissue like juniper, but coarser. Ligneous zones generally eccentric, very undulating. Wood of heart reddish-brown, sometimes purple. Sapwood whitish-yellow, moderately hard and heavy.

Fig. 60. Tangential section, *Taxus baccata.*—Showing spiral tissue throughout the entire wood.

Fig. 61. Transverse section, *Wellingtonia gigantea.*—Medullary rays larger than in the other pines, numerous and straight. Tracheides also larger than in pines. Resinous pores very inconstant, frequently met with in large groups. Wood reddish-brown, very light.

Fig. 62. Tangential section, *Wellingtonia gigantea.*—Shows the difference in the construction of the medullary plates from that in other pines. Example, tangential section, Larix and Cedrus.

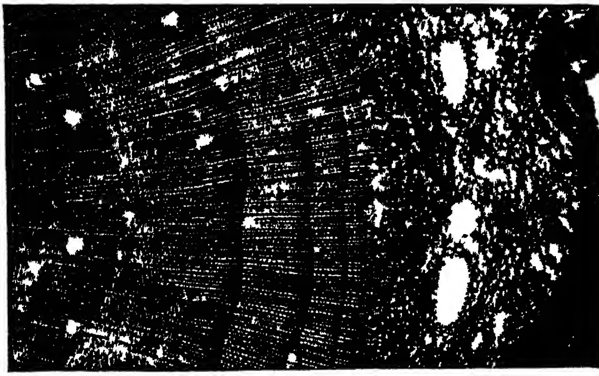


Fig. 56.—*Pinus sylvestris* (transverse section).

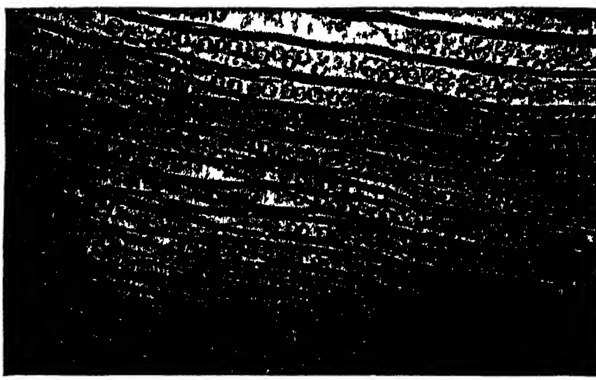


Fig. 57.—*Pinus sylvestris* (*pitted cells*) (radial section).

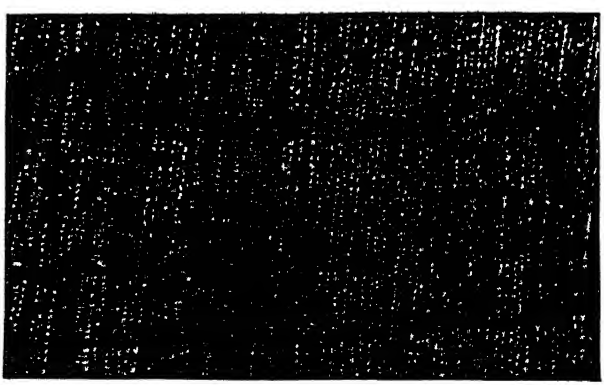


Fig. 58.—*Salisburia adiantifolia* (transverse section).

II. *Hardwood or Leafy Trees.*

Fig. 63. Transverse section, *Acer campestre.*—Medullary rays numerous, narrow, frequently tapering and jointed-like, straight. Pores of nearly uniform size, pretty small, not very numerous, placed in ones, twos, and threes. Tissue fine. Ligneous zones separated by a dark very narrow line. Wood similar to that of true plane, whitish-brown or reddish, heavy and fairly hard.

Fig. 64. Transverse section, *Acer platanoides.*—Medullary rays very numerous, average size, straight, some of them touching the pores. Pores pretty uniform and fairly numerous, moderately small, isolated in twos and threes, sometimes fours and fives, uniformly dispersed between the rays. Tissue pretty loose. Ligneous zones visible, undulated. Wood shows no heartwood, is of a yellowish-white or reddish colour, fairly hard and heavy.

Fig. 65. Transverse section, *Acer pseudo-platanus.*—Resembles the plane or maple in the general texture, but distinguished from it by its ligneous zones or rings, which are perfectly rounded, more visible, and the pores not so uniformly placed. Tissue generally more spongy.

Fig. 66. Tangential section, *Acer pseudo-platanus.*—Showing size and number of medullary rays.

Fig. 67. Tangential section, *Æsculus hippocastanum.*—Medullary rays very numerous, slightly twisting. Pores equal, very fine, numerous, isolated or in twos, threes, and sometimes sevens, distributed uniformly or in lines slightly dendroid. Tissue spongy. Zones visible, but often not well marked because of the less density of the wood and want of pores in the band of autumn wood. Wood white, light, and soft.

Fig. 68. Transverse section, *Alnus glutinosa.*—Medullary spots numerous, dispersed sometimes in circles in the summer and autumn woods. Medullary rays very numerous, composite, and moderately broad, with exceptionally small rays, which avoid the groups of pores. Pores fairly equal, moderately numerous, small, from one to six in a group, uniformly divided, or sometimes in lines a little dendroid or concentric. Tissue visibly loose. Ligneous zones very marked by the autumn wood being free from pores, and by a band of smaller and more numerous pores of the spring wood carrying itself outward between the larger medullary rays. Wood reddish, streaked with brownish red in bands parallel to zones—colour accounted for by medullary spots—rather soft and light.

Fig. 69. Transverse section, *Alnus incana.*—Distinguished from *Alnus glutinosa* by the medullary spots being less frequent and narrower; by the smaller number or absence of pores in the late autumn wood; medullary rays broad beside numerous very fine rays; by a little more fineness of woody tissue; by zones of growth regularly rounded; lastly, by wood less marked with red. Wood of same quality and texture as *Alnus glutinosa.*

Fig. 70. Transverse section, *Betula alba.*—Medullary spots rather numerous at the centre, of a brown colour. Medullary rays numerous, narrow, slightly twisted. Pores different in size, rather numerous, moderately fine, forming groups of from one to eight, disposed uniformly along dendroidal lines. Tissue fine, visible. Annual zones well rounded, marked by a line of brown autumn wood and sometimes by a narrow band of spring wood devoid of pores. Wood yellowish-white, often spotted reddish, tough, and of medium weight.

Fig. 71. Transverse section, *Root of Betula alba.*—Shows uniformity of tissue, pores, and medullary rays.

Fig. 72. Transverse section, *Carpinus betulus.*—Some small medullary spots. Medullary rays numerous, broad, composite, and straight, smaller ones making place for the groups of pores. Pores variable, pretty numerous,

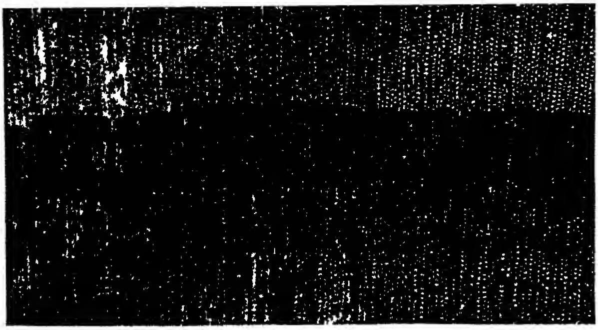


Fig 59 —*Taxus baccata* (transverse section)

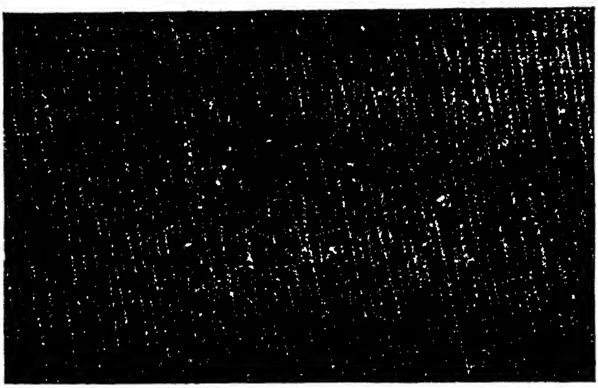


Fig 60 —*Taxus baccata* (tangential section)

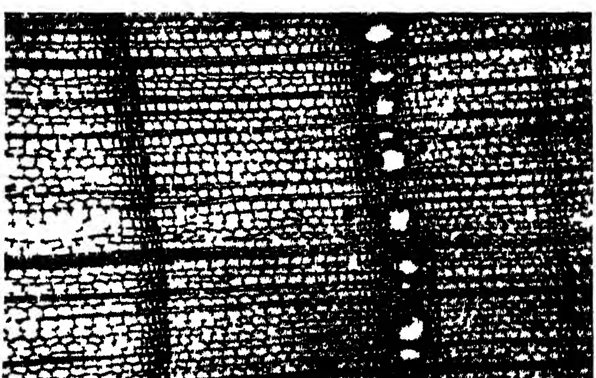


Fig 61 —*Wellingtonia gigantea* (transverse section)

fairly fine, isolated or in groups of from two to sixteen, joined by broad and dendroid rays, or in simple straight lines between the subsidiary or small rays. Tissue hardly visible, spongy, with concentric rings of larger cellules. Zones of wood marked by an edging of firmer autumn wood and by a band or lines of spring pores very much waved, lines coming towards the centre to meet large medullary rays. Wood white, hard, and heavy.

Fig. 73. Transverse section, *Castanea vesca.* — Medullary rays very numerous, very narrow, undulated so as to avoid the pores. Pores very different in size, large, isolated, sometimes in twos, often surrounded by a little circle of spongy tissue. Tissue visibly loose, presenting some concentric and undulating lines of more spongy tissue. Ligneous zones very marked by autumn wood, with a few small pores, and by the circle of large spring pores a little waved. Heartwood light-brown. Sapwood yellowish-white. Wood hard, heavy, and durable.

Fig. 74. Transverse section, *Celtis australis.* — Medullary rays narrow, average size, sometimes larger, a little zigzag, and slightly avoiding the pores. Pores numerous, isolated or in groups of from two to eight, pretty large, dispersed, or in dendroid concentric circles. Tissue visibly a little loose, more spongy in radial lines and in circles round about the groups of pores. Zones very marked by a dark autumn line, by the diminution of pores in the outer edge, and by a circle of large spring pores. Heartwood grey-brown. Sapwood greenish-yellow, like butternut. Wood average weight and hardness.

Fig. 75. Transverse section, *Cercis siliquastrum.*—Medullary rays very numerous, fairly straight, smallest undulated, and touching the pores. Pores very unequal, being large, medium, and very small, isolated and forming groups. Smaller ones disposed in dendroid circles. Tissue loose, that surrounding the groups of pores more spongy. Ligneous zones marked by an autumn band showing only the very small pores, as well as a strong band of large spring pores, well rounded and regular. Heartwood brown. Sapwood brownish-white. Wood heavy and hard.

Fig. 76. Transverse section, *Cornus mascula.* — Medullary rays very numerous, medium, tapering often in points, pretty straight. Pores of different size, fairly numerous, and pretty fine, scattered, sometimes in twos uniformly dispersed. Tissue hardly visible. Woody zones pretty well marked by a band of autumn wood with few pores, and by a line of spring pores. Heartwood dark reddish - brown. Sapwood white, bordering in red, sometimes yellow, extremely hard and heavy.

Fig. 77. Transverse section, *Corylus avellana.*—Medullary spots rare at centre. Medullary rays very numerous, broad, composite, slightly undulating, or touching on the groups of pores. Pores very equal, moderately numerous, and rarely in small numbers, mostly in groups up to twelve, rather small, disposed in radiating lines or in broad rays. Tissue and zones of growth in general as in the Hornbeam, but, unlike the latter, zones are nearly circular, sometimes a little waved where touching the larger medullary rays. Wood white or reddish-white, a little soft, of medium weight.

Fig. 78. Transverse section, *Root of Cratægus oxyacantha.*—Medullary spots frequently very marked. Medullary rays very numerous, narrow, slightly twisting. Pores slightly different, very numerous, isolated or in pairs, rarely in threes, uniformly dispersed. Tissue very fine. Woody rings marked by summer wood a little more closely packed or by a dark autumn line, and by a spring zone richer in pores and few if any in the autumn band. Concentric rings slightly waved. Tissue of the root more regular than that of the wood. Wood reddish, very hard and heavy.

Fig. 79. Transverse section, *Cytisus laburnum* (*alpinum*).—Medullary rays very numerous, fairly broad, straight. Pores diversified, few in number,

Fig. 62.— *Wellingtonia gigantea* (tangential section).

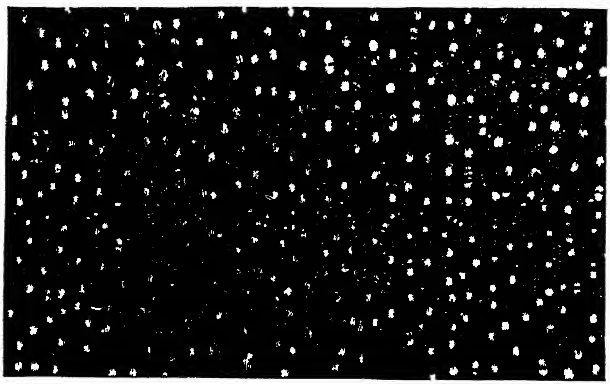


Fig. 63.—*Acer campestre* (transverse section).

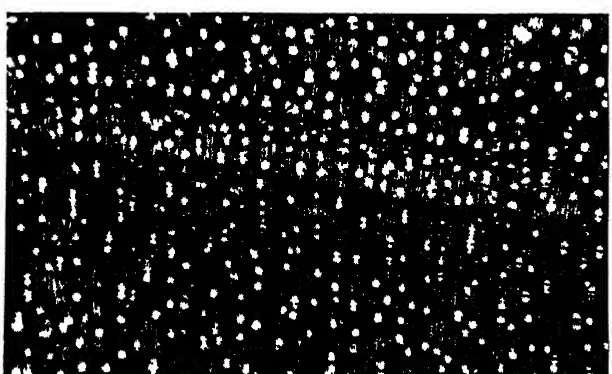


Fig 64.—*Acer platanoides* (transverse section).

isolated and in groups of two, three, four, up to fifty, in ramified and in circular lines. Tissues fine, dense, groups of pores surrounded by some spongy tissue. Ligneous zones distinct as in the *Cercis siliquastrum*, well rounded. Heartwood very yellow, sometimes approaching to black. Sapwood yellow. Wood hard and fairly heavy.

Fig. 80. Transverse section, *Fagus sylvatica.*—Medullary rays numerous, moderately broad, but of inconstant breadth from the interior outwards, and sometimes tapering, giving a jointed-like appearance in the zone at the end of the autumn wood. Pores with little difference, very numerous, isolated or in groups of twos, threes, fours, and sometimes fives, small, uniformly dispersed. Tissue hardly recognisable, interspersed with larger cellules. Ligneous zones well marked by a band of autumn wood, with fewer pores, and curved outwards between the medullary rays. Wood reddish, heavy, and hard.

Fig. 81. Tangential section, *Fagus sylvatica.*—Shows size and diversity of medullary plates or rays and longitudinal arrangement of the tissue.

Fig. 82. Transverse section, *Fraxinus excelsior.*—Medullary rays numerous, narrow, straight, touching pores. Pores in small numbers, differing greatly in size, dispersed in ones and twos, here and there threes and fours, fairly large, uniformly divided or in branching lines, seldom in circular lines. Tissue loose, spongy tissue surrounding the exterior group of pores. Zones very distinct, circular, or in old trees angular. Heartwood brown. Sapwood white. Wood hard and fairly heavy.

Fig. 83. Transverse section, *Juglans nigra.*—Medullary rays numerous, average size, straight generally, avoiding the pores. Pores variable, in size and number moderately large, isolated or in pairs, sometimes in threes and fours, uniformly dispersed. Tissue loose with concentric lines of spongy tissue. Ligneous tracts hardly visible, indicated only by a narrow dark autumnal line, and often also by a line or insignificant band of large spring pores, surrounded by more spongy tissue. Heartwood brown. Sapwood white. Wood hard and pretty heavy.

Fig. 84. Transverse section, *Legatta lintearia.*—Medullary rays numerous, large, straight, composite, with marginal lines of oval or elongated cells on their exterior. Pores medium, numerous in groups among spongy tissue; ordinary tissue hardly visible. Zones invisible generally, but sometimes the pores appear larger in the spring wood than in the autumn wood. Wood dark-brown, hard, heavy.

Fig. 85. Tangential section, *Legatta lintearia.*—Showing medullary rays *in situ* amongst the fibro-vascular bundles, the latter presenting a jointed appearance. Cells forming medullary rays extremely fine, in groups from a few dozen to several thousands in a ray or plate.

Fig. 86. Transverse section, *Magnolia accuminata.*—Medullary rays numerous, medium, straight, bulging at termination of the zones, in old trees full of dark pigment. Pores not numerous, small, isolated, in groups of twos and threes. Tissue fairly visible, spongy. Zones well marked by absence of pores in the autumn wood and the pigment in the enlarged part of the medullary ray. Wood yellowish-white, fairly hard, and heavy.

Fig. 87. Transverse section, *Morus nigra.*—Medullary rays very numerous, medium size, straight, smaller ones avoiding pores. Pores very unequal, fairly numerous, isolated, in pairs, sometimes in threes, or even in small groups of as many as eight, scattered, adjoining, in ramifications, sometimes in circles. Tissue hardly visible, a little tissue more spongy round groups of pores, and here and there in narrow circular undulating lines. Zones very marked, fairly well rounded. Heartwood yellowish-brown. Sapwood yellowish-white. Wood hard and fairly heavy.

Fig. 88. Tangential section, *Morus nigra.*—Showing medullary plates and dotted tissue, somewhat similar to fig. 85. Vascular bundles not jointed.

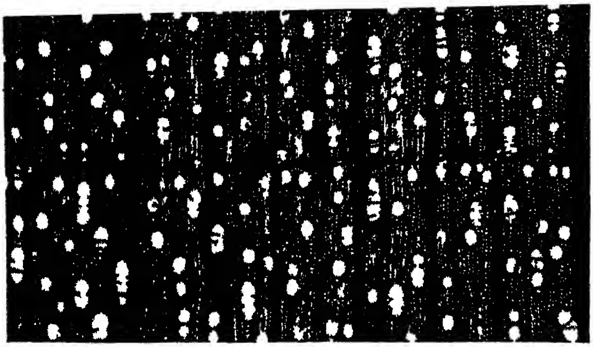


Fig. 65.—*Acer pseudo platanus* (transverse section).

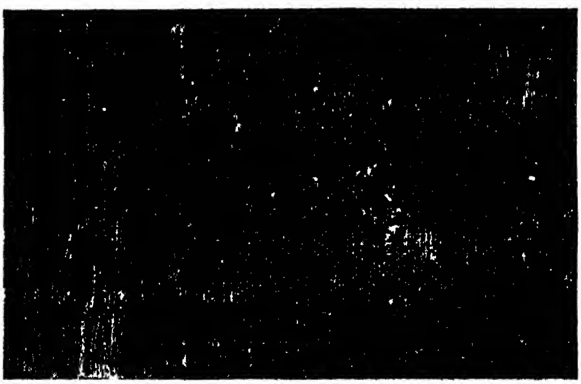


Fig. 66.—*Acer pseudo platanus* (tangential section).

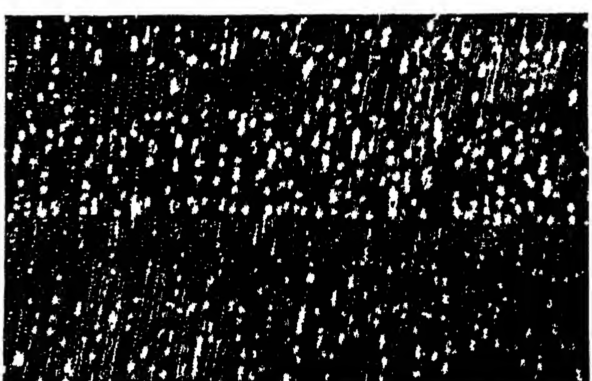


Fig. 67.—*Æsculus hippocastanum* (transverse section).

Fig. 89. Transverse section, *Phillyrea stricta.* — Medullary rays very numerous, fine, often tapering, straight. Pores pretty uniform, very numerous and small, disposed in flame-like form, containing ten to one hundred or more, which anastomose and change direction from one zone to another. Ordinary tissue hardly visible, spongy tissue surrounding groups of pores and forming spring bands. Zones not constant in size, sometimes hardly separated by more than a simple line of pores, but generally marked by the extended base of groups of pores, moderately well rounded, and sometimes slightly undulated. Heartwood reddish-brown. Sapwood reddish-white. Wood heavy and hard.

Fig. 90. Transverse section, *Platanus acerifolia.*—Medullary rays very numerous, moderately broad, going in straight lines from heart to bark. Pores varying little, rather smaller in the autumn wood, very numerous, isolated, or in groups of from two to six, fairly small, uniformly dispersed. Tissue visibly spongy, interspersed with scattered cellules. Zones of growth fairly visible, usually indicated by a dark autumn line very well rounded and the jointed appearance of the medullary rays. Heartwood brown, tinged with red. Sapwood reddish-white. Wood hard and heavy.

Fig. 91. Transverse section, *Platanus occidentalis.* — Medullary rays moderately large, fairly numerous, jointed-like at termination of zones, straight and regular. Pores medium, small, varying little in size, very numerous, isolated in pairs, threes, fours, and sometimes fives in the early spring wood. Tissue slightly spongy and of the same consistency throughout the zone. Zones scarcely visible on account of general uniformity of pores and tissue. Wood yellowish-white throughout, except when grown in calcareous soils. Heartwood then reddish-brown. Sapwood yellowish-white. Wood hard and heavy.

Fig. 92. Tangential section, *Platanus occidentalis.*—Presents practically the same appearance as *Acer pseudo-platanus,* only more uniform in composition.

Fig. 93. Transverse section, *Populus tremula.*—Medullary spots moderately numerous, white, with tails pointing inwards. Medullary rays numerous and fine. Pores fairly small, isolated or in groups of from two to seven uniformly distributed, sometimes ramifying. Ligneous zones well rounded in young trees, sometimes well marked by the medullary spots, sometimes indifferently marked. Heartwood brown. Sapwood greenish-white. Wood soft and light.

Fig. 94. Transverse section, *Prunus avium.* — Medullary spots absent. Medullary rays medium or fairly large, generally straight, smaller ones waved. Pores pretty numerous, fine, in groups of from one to eight, in slight vermicular lines, caused by the waving of the smaller medullary rays. Tissue visibly loose. Zones of wood very marked by a deep dark line of a brown colour, narrow, and marked by a band of autumn wood containing few pores, and by a band of very porous spring wood. Heartwood yellowish-brown. Wood moderately hard, medium weight.

Fig. 95. Transverse section, *Prunus domestica.*—Medullary spots absent. Medullary rays very numerous, average size, some broader, straight, only smaller ones waved. Pores vary slightly, pretty numerous, sometimes extremely crowded, isolated in groups of from two to four, fine, equally distributed or in lines slightly dendroidal. Tissue hardly visible, wavy. Zones pretty distinct. In general appearance same as *Prunus avium.* Heartwood reddish-brown. Sapwood whitish-yellow with a green tinge. Colour varies with soil and situation. Wood fairly hard and heavy.

Fig. 96. Transverse section, *Prunus padus.* —Medullary spots absent. Medullary rays very numerous, average size straight, smaller ones touching pores. Pores variable, numerous, isolated or in groups of from two to seven, pretty fine, dispersed uniformly, but run together so as to form

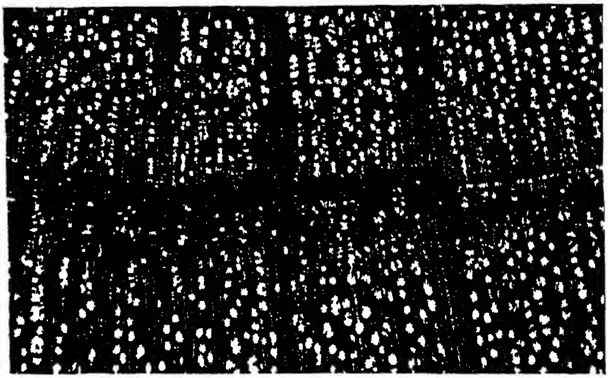


Fig. 68.—*Alnus glutinosa* (transverse section).

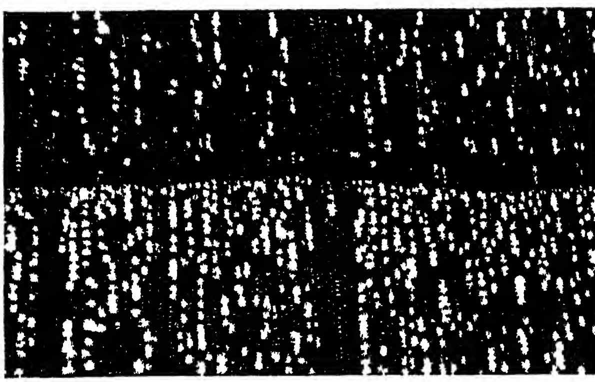


Fig. 69.—*Alnus incana* (transverse section).

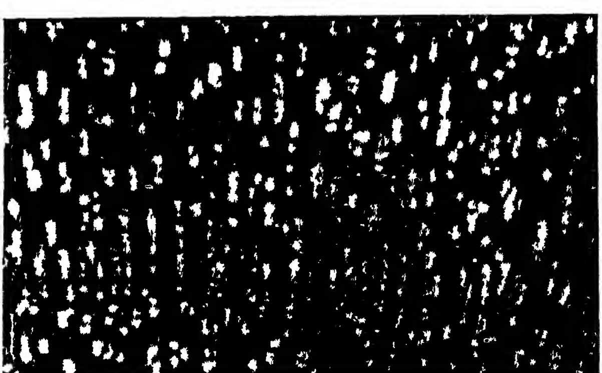


Fig. 70.—*Betula alba* (transverse section).

lines, a little dendroidal and circular. Tissue visibly spongy. Zones marked by a narrow line of brown wood with few pores, and the larger pores of the spring wood similar to *Prunus avium.* Heartwood yellowish-brown. Sapwood yellowish-white. Wood moderately hard and heavy.

Fig. 97. Transverse section, *Pyrus domestica.*—Medullary rays very numerous, fine, straight, and equal. Pores fairly numerous and fairly small, equally distributed throughout the zones, isolated generally, but sometimes in twos and threes. Zones not very apparent owing to equal density of tissue and the pores being practically of the same size in the spring and autumn wood, sometimes indicated by a thin brown line without any pores and by some medullary spots parallel to the zone. Wood very fine, hard, and heavy.

Fig. 98. Tangential section, *Pyrus domestica.*—Shows size, number, and position of medullary plates.

Fig. 99. Radial section, *Pyrus domestica.*—Shows cells of medullary rays crossing vascular tissue.

Fig. 100. Tranverse section, *Quercus alba.*—Medullary rays numerous, large, and straight, avoiding pores. Pores very large in spring wood, usually two-rowed. Those in autumn wood extremely small in flame-like groups. Zones very indistinct except for size of pores. Heartwood dark-brown. Sapwood dirty white. Wood very hard and heavy.

Fig. 101. Transverse section, *Quercus cerris.*—Similar in every respect to *Quercus pedunculata,* but with medullary rays more numerous and sometimes broader. Pores fewer, but larger in the spring wood. Tissue slightly visible.

Fig. 102. Transverse section, *Root of Quercus cerris.*—Medullary rays very equal, large, and numerous. Pores more variable than in the tree. Zones invisible. Secondary circles more apparent. Wood of root much darker and harder than of the tree.

Fig. 103. Transverse section, *Quercus Ilex.*—Some small medullary spots. Medullary rays extremely numerous and broad, of closer tissue than the wood, slightly twisted. Pores differing greatly, fairly large, often large, isolated, dispersed in tails. Tissue compressed, nearly invisible. Zones of wood hardly recognisable in the autumn wood, which is less porous but full of spongy lines, but indicated by larger pores in the spring wood. Wood dark-brown, nearly same colour throughout, hard and heavy.

Fig. 104. Tangential section, *Quercus Ilex.*—Showing diversity in size of medullary rays. These range from a few cells to several thousands in thickness, hence the difficulty in splitting the wood.

Fig. 105. Transverse section, *Quercus suber.*—Medullary rays very broad, numerous, straight, ends undulated. Pores very equal, not numerous, isolated, moderately large, disposed in long lines. Tissue hardly visible. Zones less apparent than in *Quercus pedunculata.* Pores giving no indication of zone, the lines passing into those of the preceding year, and often leaving for limit only a brown autumn line, better rounded than in the ordinary oaks. Heart reddish-brown. Sapwood dirty white. Wood extremely heavy and dense.

Fig. 106. Transverse section, *Quercus pedunculata.*—Medullary rays numerous, broad, straight, small ones touching pores. Pores differing greatly in size, not numerous, large, isolated, small ones grouped in tails. Tissue hardly visible, crowded with concentric and undulating lines, and circles of larger cellules surrounding the groups of pores. Ligneous zones marked by the diminution towards the circumference and by large spring pores towards the interior, irregularly concentric, and arched at the contact of the large medullary rays. Heartwood dark-brown, sometimes reddish, yellow, or black. Sapwood brownish-white. Wood heavy and hard.

Fig. 107. Transverse section, *Quercus robur.*—Very similar to *Quercus pedunculata,* but with inferior pores, usually more flame-like.

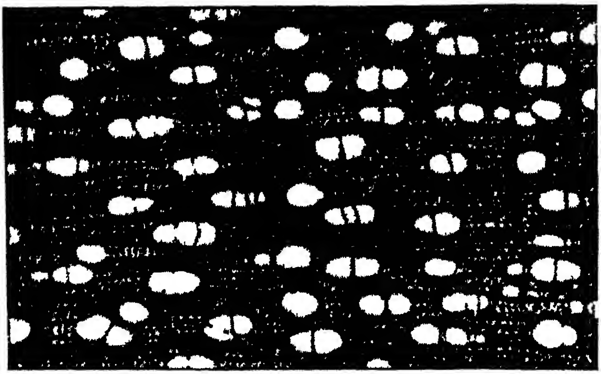


Fig 71 —*Betula alba* (*root*) (transverse section)

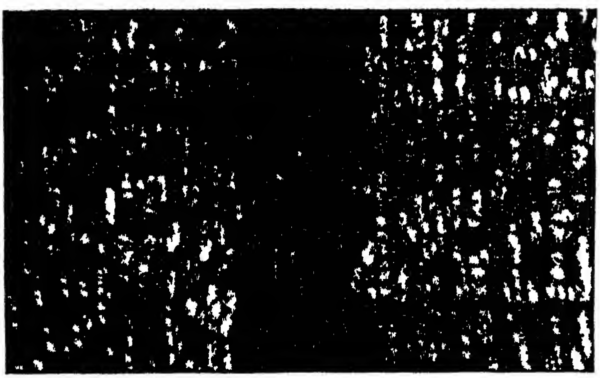


Fig 72 —*Carpinus betulus* (transverse section)

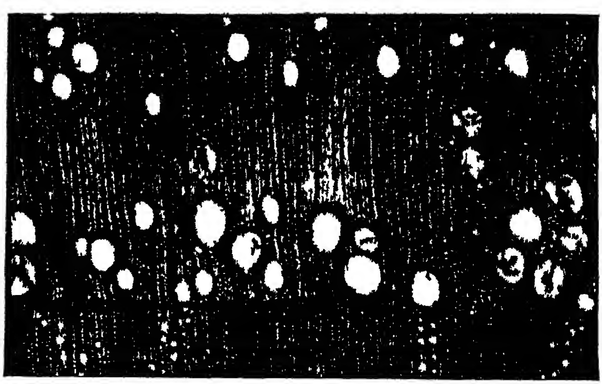


Fig 73 —*Castanea vesca* (transverse section)

Fig. 108. Transverse section, *Rhamnus catharticus.*—Medullary rays extremely numerous, straight, sometimes undulating. Pores with little variation, very numerous, and closely packed, as many as fifty in a group, very small, distributed in flame-like form. Tissue hardly visible. Zones of wood very marked by a small dark autumn line, by the decrease in the number of pores towards the outer edge, and by a band of spring pores almost concentric. Heartwood yellowish-red. Sapwood whitish-yellow, sometimes greenish. Wood hard and heavy.

Fig. 109. Transverse section, *Rhamnus frangula.*—Medullary rays numerous, narrow, straight, slightly turning the pores aside. Pores very variable, isolated or formed in groups of two, three, and sometimes seven, rather fine, scattered or in touching lines. Tissue visibly loose. Zones distinct, rounded, and angular. Heartwood reddish-yellow. Sapwood yellow. Wood light and soft.

Fig. 110. Transverse section, *Robinia (pseudo-acacia).*—Medullary rays numerous, average size, carefully avoiding pores. Pores very variable, fairly numerous, isolated, sometimes in twos and up to ten in the external groups, large, uniformly disposed in the spring wood, in dendroid or concentric rings in the autumn wood. Tissue visibly loose, more spongy in some radial lines of the spring band, and in the form of arches round about groups of external pores. Zones very marked in young wood, angular in old. Heartwood very dark-brown, with yellow or greenish tinge. Sapwood yellow. Wood hard and heavy.

Fig. 111. Transverse section, *Salix alba.*—Medullary spots rather frequent. Medullary rays very numerous, extremely fine, often twisting. Pores differing little, smaller towards the outer border of the zones, very numerous, isolated, sometimes in twos, threes, and even fives in the autumn wood, rather fine, dispersed uniformly, and slightly worm-shaped. Tissue loose, with cellules or rays of stronger cellules. Zones of wood marked by an exterior border of smaller pores and sometimes by a close line or band of spring pores, a little angular. Heartwood of a dirty yellow red. Sapwood white. Wood very soft and very light.

Fig. 112. Transverse section, *Salix caprea.* — Few medullary spots. Medullary rays numerous, fairly straight. Pores isolated and in groups up to seven in a group. Ligneous zones hardly apparent. In general appearance very like *Salix alba.* Heartwood of a marbled yellowish-brown. Sapwood yellowish-white. Wood slightly harder than *Salix alba.*

Fig. 113. Transverse section, *Salix daphnoides.* — Without medullary spots. Medullary rays numerous, not twisted as in *Salix alba,* very fine. Pores average, uniform, slightly fewer and smaller in the autumn wood, very numerous generally, isolated and in groups of from two to five. Tissue rather loose and irregular. Zones indicated by the pores being smaller in the autumn wood, and by the spring pores immediately adjoining being slightly more crowded. Heartwood dark yellow, tinged with red. Sapwood white. Wood soft and light.

Fig. 114. Transverse section, *Sorbus (Pyrus) Aucuparia.* — Medullary spots numerous, especially towards the centre. Medullary rays with tails towards the outside of ordinary thickness, numerous, slightly twisting. Pores a little variable, not very numerous, isolated or in groups of twos and threes, sometimes fours and fives, fine, uniformly distributed. Tissue loose. Woody zones, sometimes well marked by a line or darker exterior band with few pores, and often by a line or band of numerous spring pores. Heartwood reddish-brown. Sapwood brownish-white. Wood fairly hard and of average weight.

Fig. 115. Transverse section, *Tilia parviflora.*—Medullary rays numerous, narrow or medium, moderately straight, although avoiding groups of pores. Pores varying in size, not very numerous, isolated or united in lines or shapeless groups of from two to five, which often crowd each other,

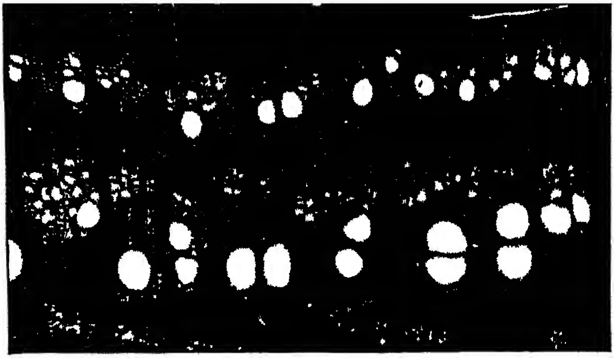


Fig. 74.—*Celtis australis* (transverse section).

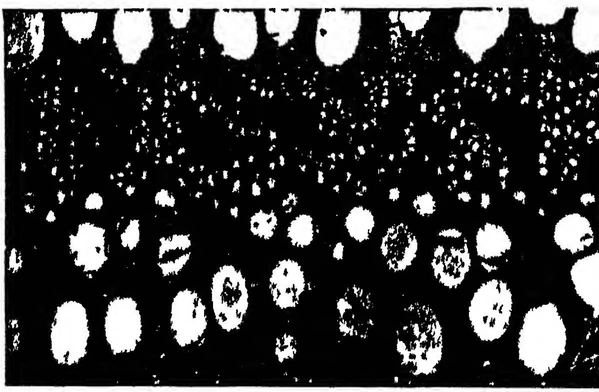


Fig. 75.—*Cercis siliquastrum* (transverse section).

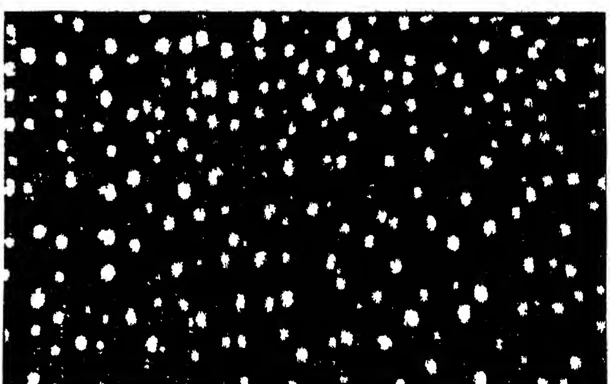


Fig. 76.—*Cornus mascula* (transverse section).

small, uniformly divided. Tissue irregular and spongy, here and there more or less compact. Rings rendered distinct by a darker outer edge with fewer pores, rather than by a deep band of spring pores, well rounded. Wood white, soft, and light.

Fig. 116. Transverse section, *Ulex europæa.*—Medullary rays numerous, fairly broad, and twisted. Pores very unequal, not numerous, isolated or grouped in twos, threes, or fours, average size, distributed in beautifully ramified flame-like forms, often unequally. Tissue hardly perceptible, but groups of pores surrounded by tissue more spongy, particularly so in the spring wood. Zones very distinct and very waved. Wood reddish-white or yellowish, often very marked at the heart, hard and very heavy.

Fig. 117. Transverse section, *Root of Ulex.*—Tissue more spongy than that of the stem.

Fig. 118. Transverse section, *Ulmus campestris.*—Medullary rays very numerous, average size, undulated. Pores varying much, numerous, isolated or in groups of from two and three to several dozens, fairly large in spring wood, smaller in autumn wood, in which they appear in dendroid circles. Tissue visibly loose, with more spongy texture round groups of pores and in bands of tissue enclosed between two rays. Ligneous zones very distinct by the larger pores in the spring wood and almost entire absence of pores in late autumn wood. Heartwood brownish-red. Sap-wood yellowish-white. Wood hard and moderately heavy.

Fig. 119. Tangential section, *Ulmus campestris.*—Shows disposition, number, and size of medullary rays.

Fig. 120. Transverse section, *Ulmus effusa.*—Similar to *Ulmus campestris*, but with pores more uniformly dispersed, especially those in spring wood. Zones rendered more apparent by close line of superior pores in the spring wood lying immediately on the outside of the autumn wood. Tissue more regular. Wood same as *Ulmus campestris.*

Fig. 121. Transverse section, *Ulmus montana.*—Also similar to *Ulmus campestris,* but with the pores in the spring wood fewer and slightly smaller, and the inferior pores in the autumn wood disposed in clouds rather than in lines. Zones not very apparent. Tissue less spongy than in *Ulmus campestris.* Wood dark-brown, hard, and heavy.

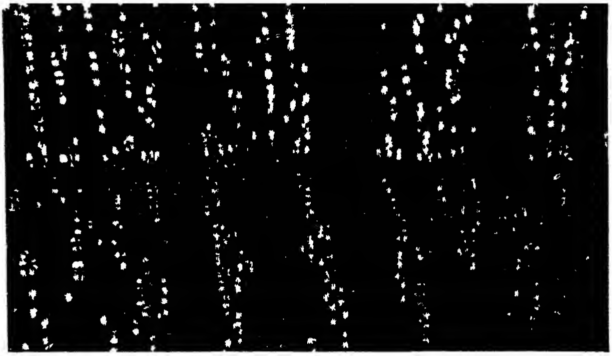


Fig. 77.—*Corylus avellana* (transverse section).

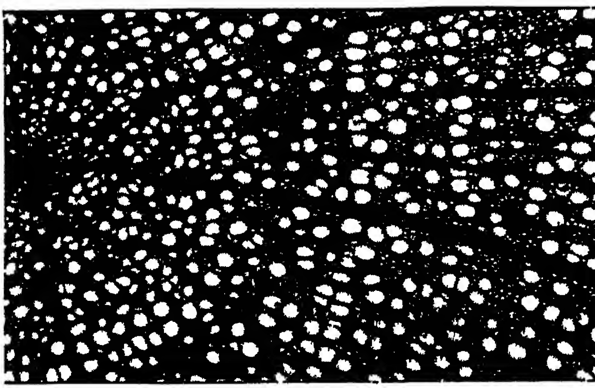


Fig. 78.—*Cratægus oxyacantha* (*root*) (transverse section)

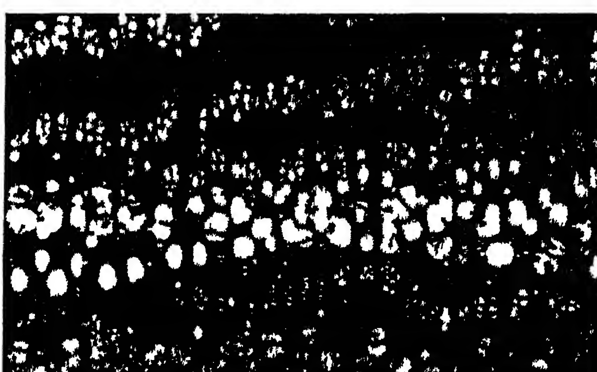


Fig. 79.—*Cytisus laburnum* (*alpinum*) (transverse section)

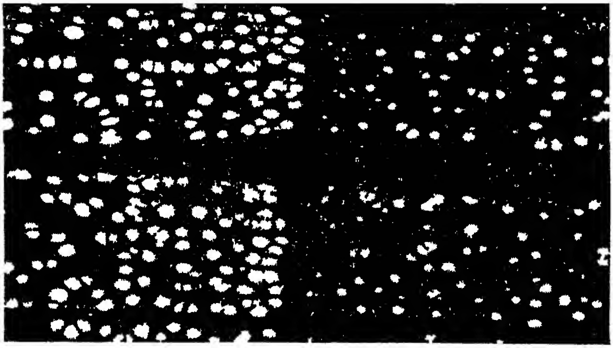


Fig. 80.—*Fagus sylvatica* (transverse section).

Fig. 81.—*Fagus sylvatica* (tangential section).

Fig. 82.—*Fraxinus excelsior* (transverse section).

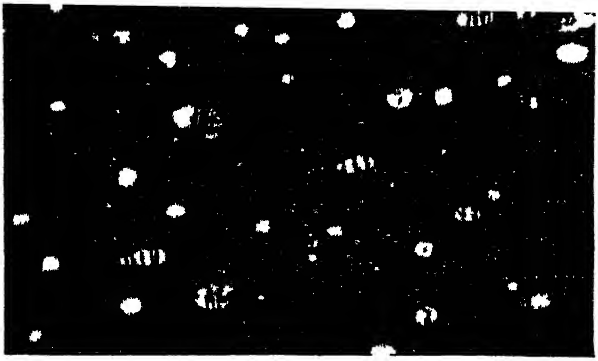


Fig. 83.—*Juglans nigra* (transverse section).

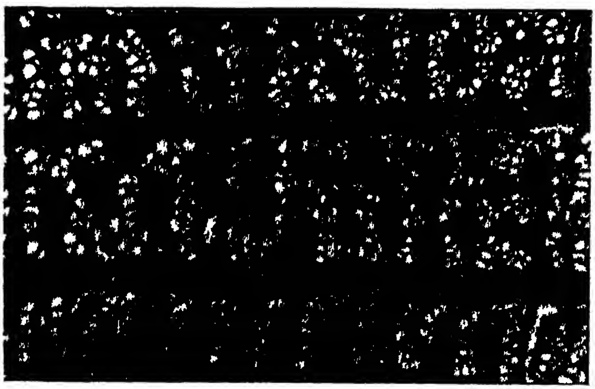


Fig. 84.—*Lagetta lintearia* (transverse section).

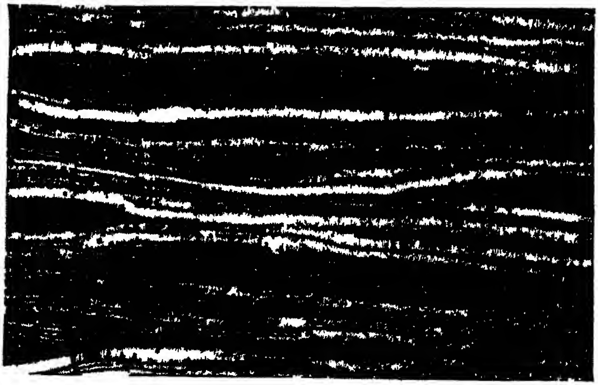


Fig. 85.—*Lagetta lintearia* (tangential section).

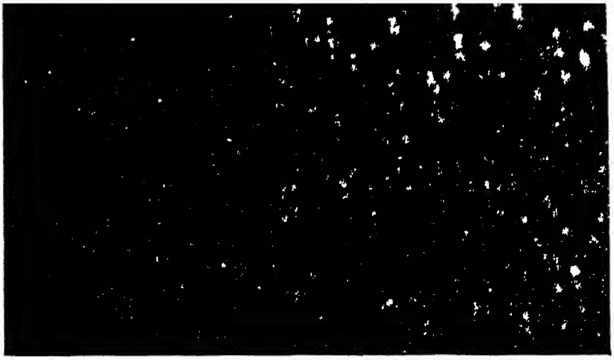


Fig. 86.—*Magnolia accuminata* (transverse section).

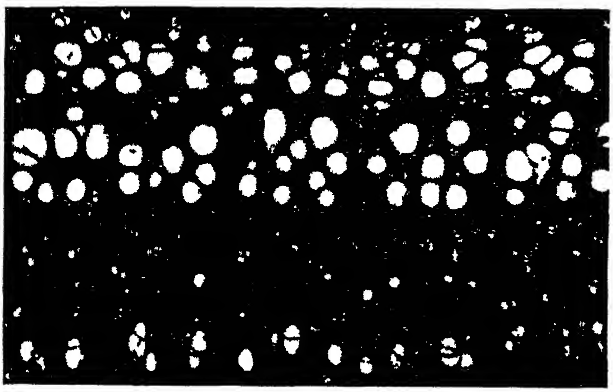


Fig. 87.—*Morus nigra* (transverse section).

Fig. 88.—*Morus nigra* (tangential section).

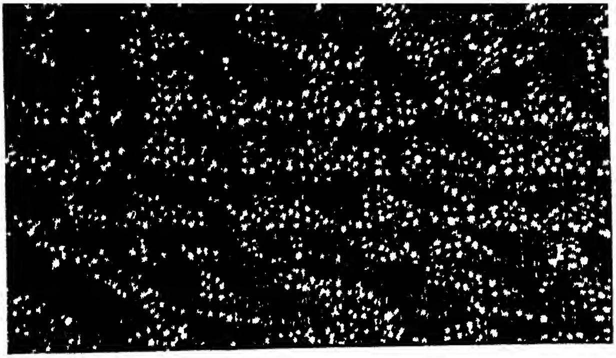


Fig. 89.—*Phillyrea stricta* (transverse section).

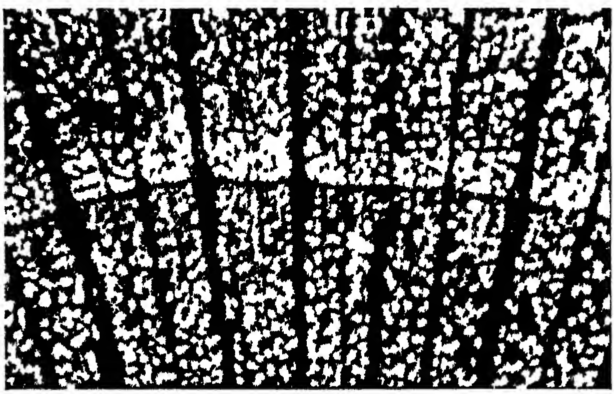


Fig. 90.—*Platanus acerifolia* (transverse section).

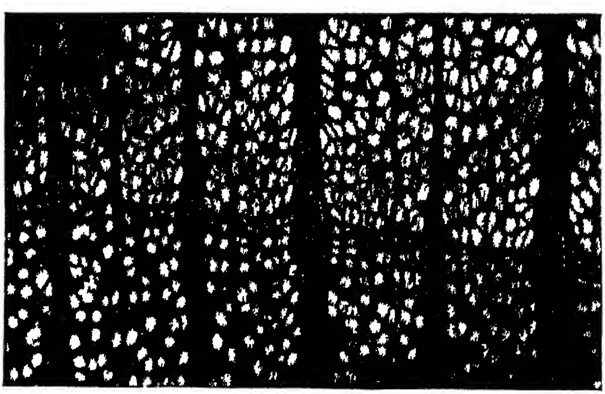


Fig. 91.—*Platanus occidentalis* (transverse section).

Fig. 92.—*Platanus occidentalis* (tangential section).

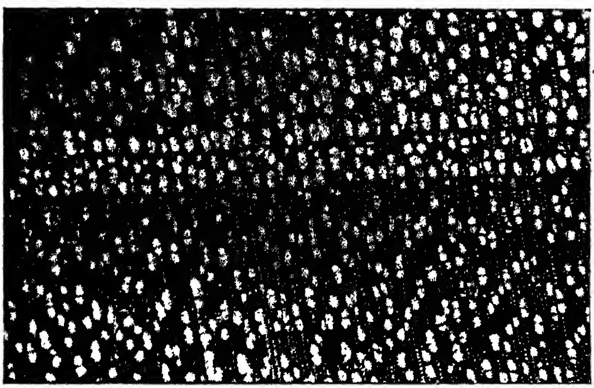


Fig. 93.—*Populus tremula* (transverse section).

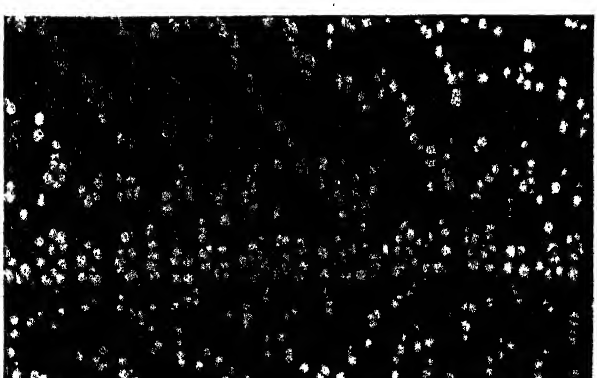


Fig. 94.—*Prunus avium* (transverse section).

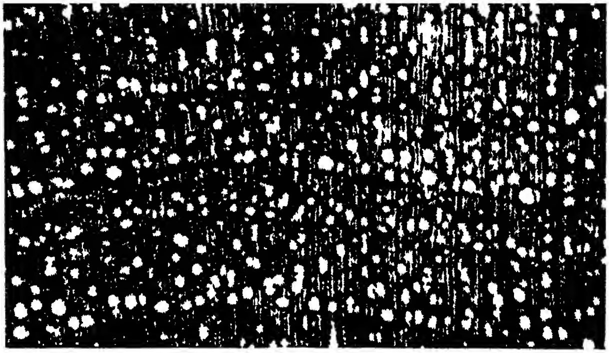


Fig. 95.—*Prunus domestica* (transverse section).

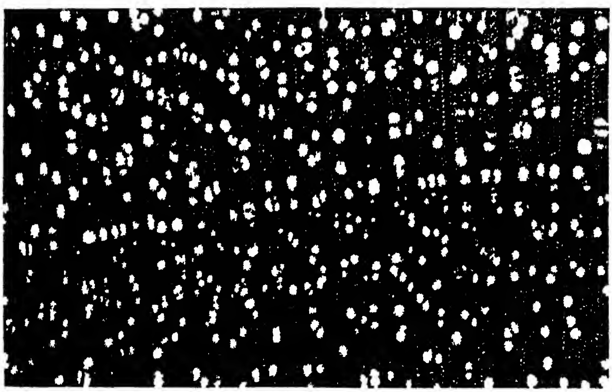


Fig. 96.—*Prunus padus* (transverse section).

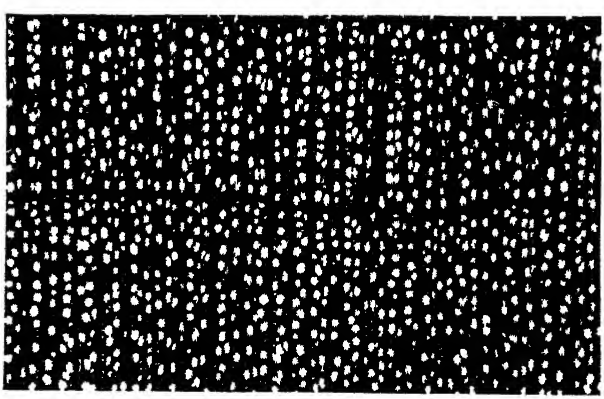


Fig. 97.—*Pyrus domestica* (transverse section).

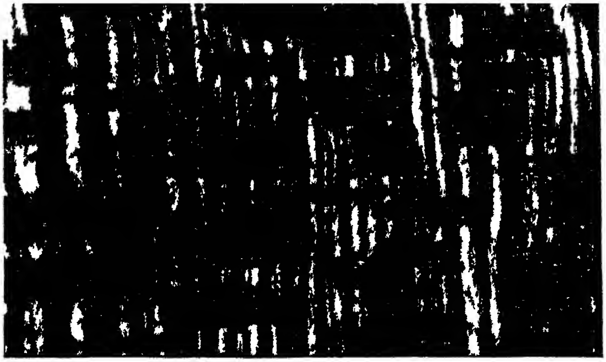


Fig. 98.—*Pyrus domestica* (tangential section).

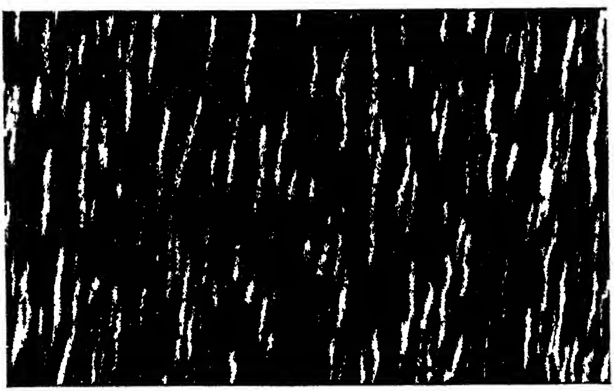


Fig. 99.—*Pyrus domestica* (radial section).

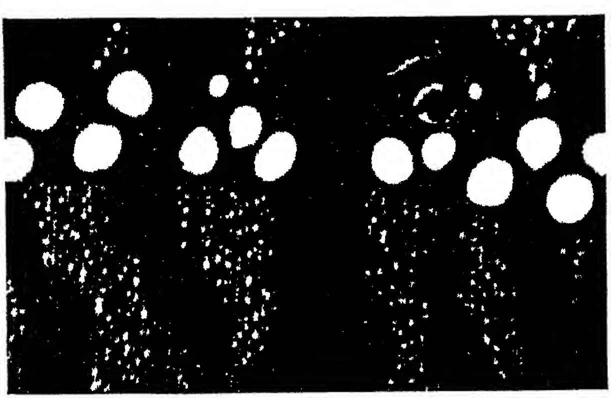


Fig 100.—*Quercus alba* (transverse section)

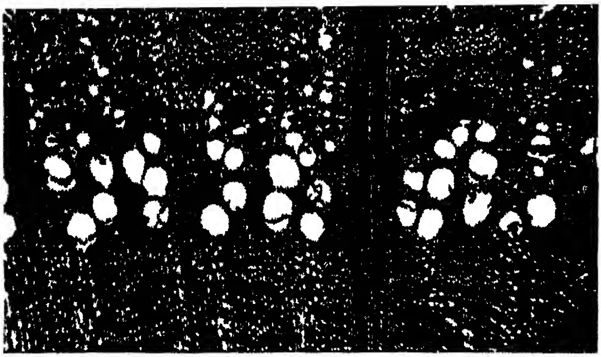


Fig. 101.—*Quercus cerris* (transverse section).

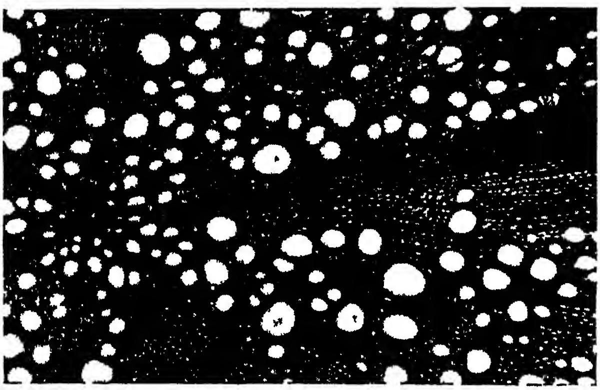


Fig. 102.—*Quercus cerris* (*root*) (transverse section).

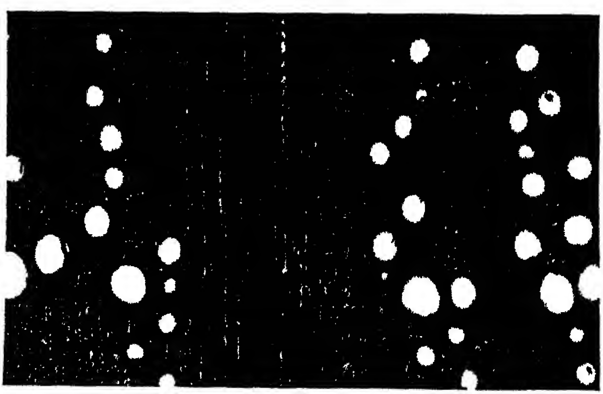


Fig. 103.—*Quercus Ilex* (transverse section).

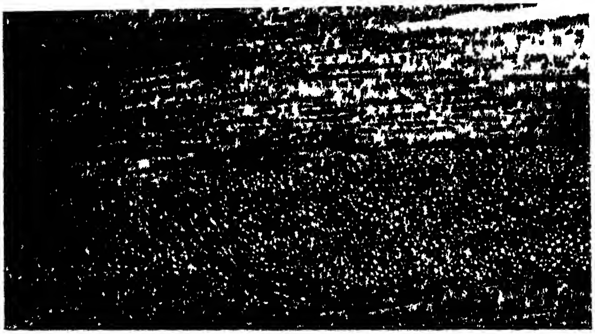


Fig. 104.—*Quercus Ilex* (tangential section).

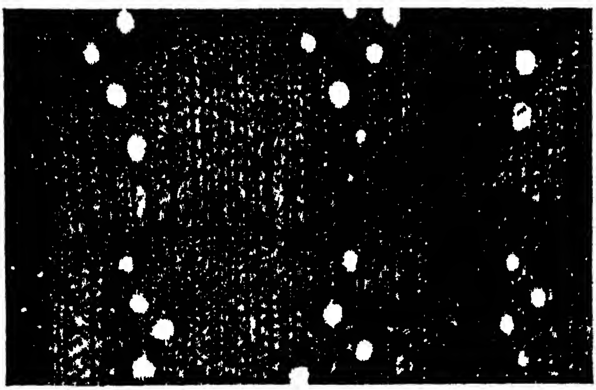


Fig 105 —*Quercus suber* (transverse section)

Fig. 106.—*Quercus pedunculata* (transverse section)

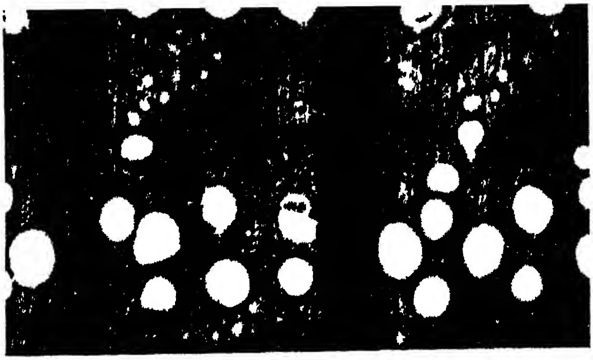


Fig. 107.—*Quercus robur* (transverse section).

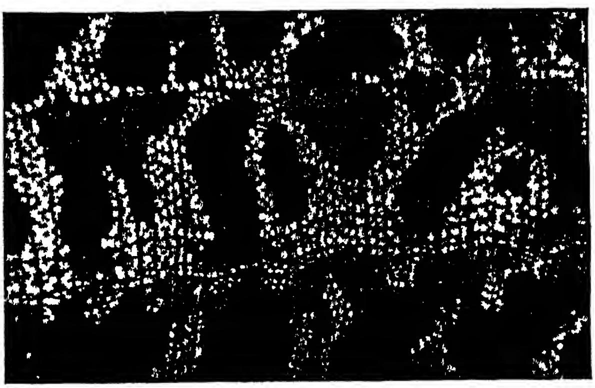


Fig 108.—*Rhamnus catharticus* (transverse section)

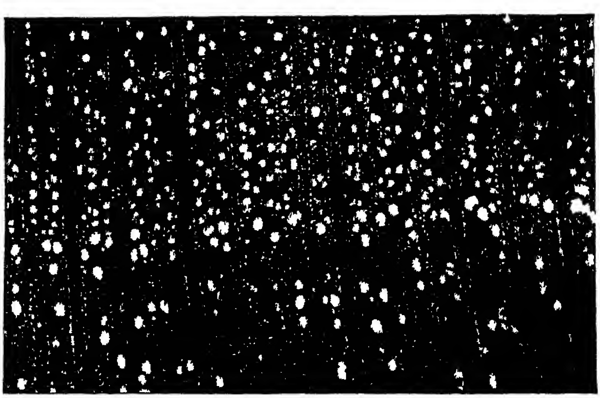


Fig. 109.—*Rhamnus frangula* (transverse section).

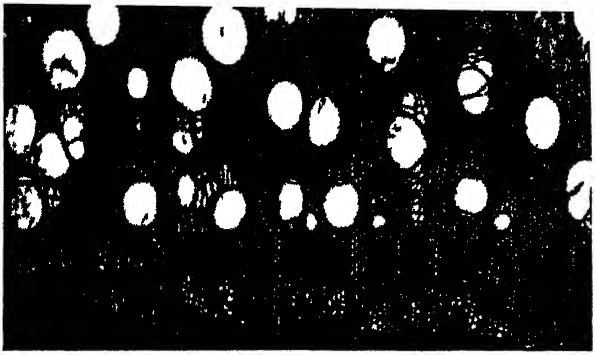


Fig 110 —*Robinia* (*pseudo acacia*) (transverse section)

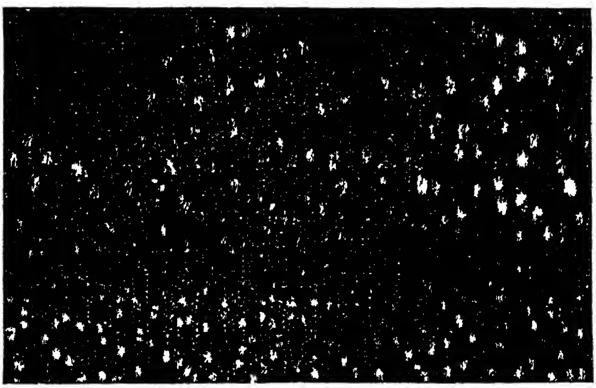


Fig 111 —*Salix alba* (transverse section)

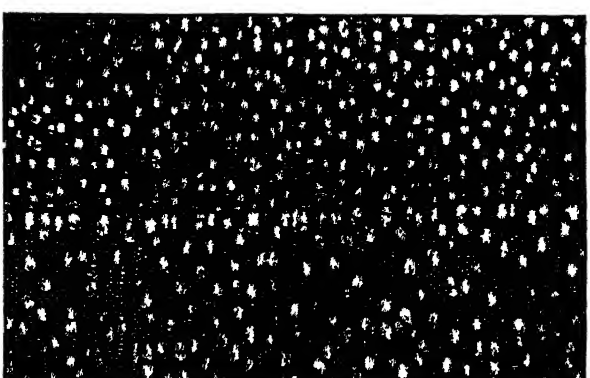


Fig 112 —*Salix caprea* (transverse section)

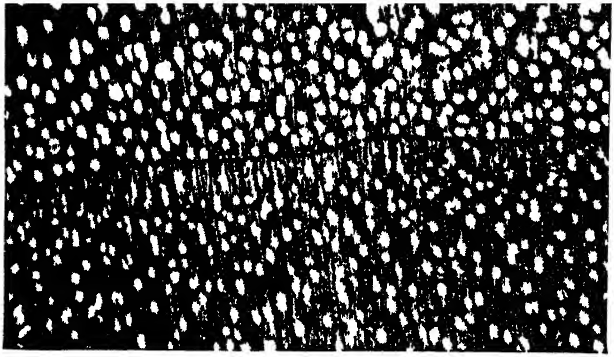


Fig. 113.—*Salix daphnoides* (transverse section).

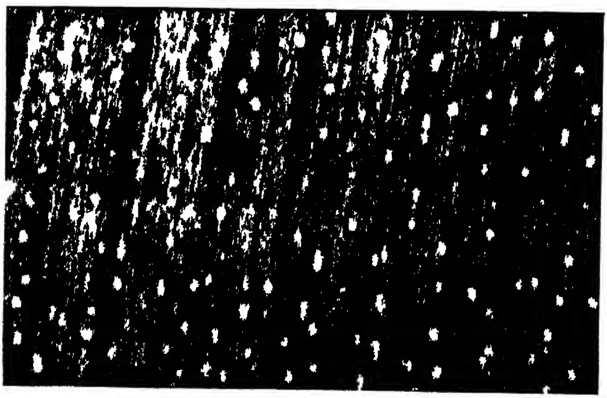


Fig. 114.—*Sorbus* (*Pyrus*) *Aucuparia* (transverse section).

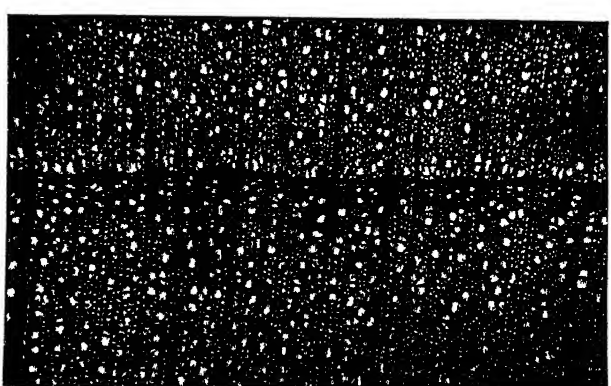


Fig. 115.—*Tilia parvifloxa* (transverse section)

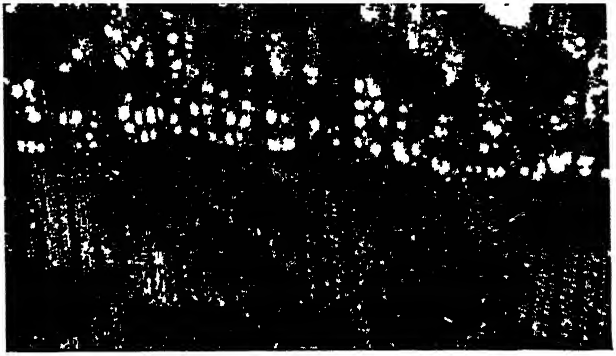


Fig. 116 — *Ulex europœa* (transverse section)

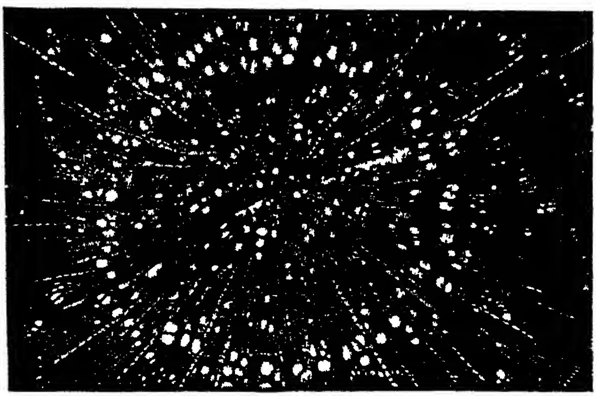


Fig. 117.—*Ulex europaa* (*root*) (transverse section)

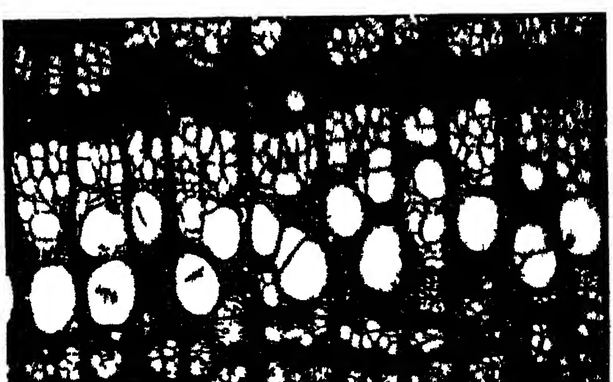


Fig 118.—*Ulmus campestris* (transverse section).

Fig 119 —*Ulmus campestris* (tangential section)

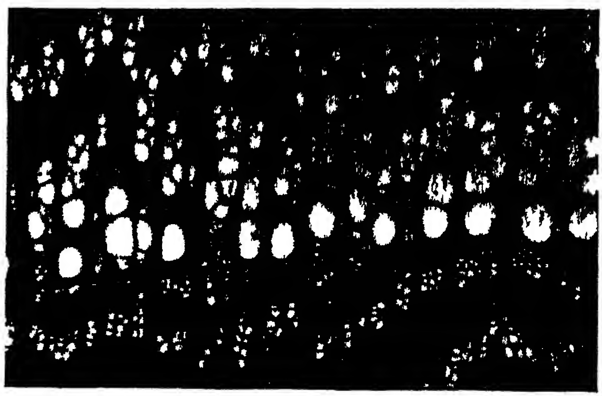


Fig 120 —*Ulmus effusa* (transverse section)

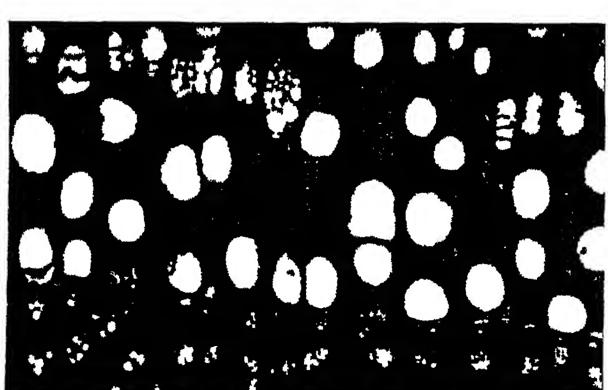


Fig 121 —*Ulmus montana* (transverse section)

THE PRODUCE OF OLD AND NEW VARIETIES OF OATS.

By JOHN SPEIR, Newton Farm, Glasgow.

THE recent introduction of several new varieties of cross-bred oats, wheats, and barleys by the Messrs Garton, Newton-le-Willows, Lancashire, has given a renewed impetus not only to the production of new varieties but to the growth of grain itself. Along with Prof. M'Alpine I visited the Messrs Garton's farm in 1893, when we had the opportunity of carefully inspecting their work, and since then I have had more than the usual interest of a farmer in the introduction of new varieties. After our visit Prof M'Alpine published in the 'Transactions'[1] of the following year a short paper explaining the work of the Messrs Garton, and their method of procedure; and any one interested in the subject and not quite familiar with the methods followed, cannot do better than read that paper, and I heartily recommend it to all farmers for careful perusal.

In the spring of 1898 the Messrs Garton offered the Highland and Agricultural Society a bushel each of three varieties of new cross-bred oats for experimental purposes. I was asked to take charge of them and test them against any well-known variety. To this I agreed, on the understanding that the results, be they good or bad, were to be published. For comparison I selected the well-known Potato oat, as being the most representative of any oat grown in Scotland, and in due time a bushel each of three varieties of oats were sent me. These were at that time unnamed, but have since been named as follows:—

1. TARTAR KING.—An early and heavy white oat.
   Pedigree. Black Tartarian, White Tartarian, and White Canadian.
   Description: Very early; grain white, large, plump, and heavy; straw strong; habit Tartarian—that is, grain all hanging on one side of the head.
2. PIONEER.—A new black oat.
   Pedigree: Black Tartarian, Scottish Potato, Waterloo, and White August.
   Description: Grain black, large, short, and plump; straw strong, and ear open pyramid.
3. WAVERLEY.
   Pedigree: Scottish Potato, Naked Oat of China, White Tartarian, and Flanders Yellow.

[1] Fifth Series, vol. vi, 1894.

Description: Ripens about the same time as the Scottish Potato oat; grain rather long and thin in the skin; straw long and strong; ear long and open pyramid.

Two acres of land in good condition, and as uniform in quality as it was possible to get it, were selected for the test, and carefully measured off in the centre of a 17-acre field. The centre of the field was selected in order to remove the test from any disturbing influences of shelter, destruction by birds, or exhaustion by fences or tree-roots, &c.

As the new cross-bred varieties came from the north of England, the change of seed might have exercised a considerable influence on the crop, irrespective of the cross-breeding. In order to as far as possible place all the varieties on even terms in this respect, a supply of seed Potato oats was procured from near the English Border, from land which was likely to afford a good change.

The land had yielded two crops of hay in 1897, after which it had received from 12 to 15 tons of farmyard manure per acre in September or October, ploughing being done in January. The soil was a very sandy loam, resting on sand, and naturally well drained. It usually produced a crop of oats giving an abundance of straw, but the quantity of grain was never very prolific nor of great weight per bushel. The plots were set out so that each was treble in length what it was in breadth, the area being one quarter of an acre. The new varieties were sown on every second plot, the intervening ones being sown with Potato oat, also those on the two sides thus:—

Potato	Waverley	Potato.	Tartar King	Potato	Black Pioneer	Potato

All round the plots and between each plot, a path 2 feet wide was left unseeded, which was kept free from weeds by repeated hand-hoeing. These strips were very useful for examination of the crop during its growth, but were specially intended to keep the different varieties separate when harvesting, as they permitted of each variety being cut without any risk of including with it any portion of a neighbouring plot.

The trial plots were sown before the remainder of the field, stakes being placed at the corners and along the sides and ends so as to ensure the purity of each variety. As a rule, all grain is sown on this farm by the drill, and as several fields had pre-

viously been sown without any change, the quantity used per acre was found to be a trifle over $3\frac{3}{4}$ bushels. The seed available permitted of sowing each plot at this rate, and still leave a margin of a few pounds to come and go upon. The seed of all the plots was sown on 4th April, the land at the time being dry and in good working condition. I supervised everything myself, and at no time allowed any operation to be performed in connection with the plots or crop when I was unable to be constantly present.

All the varieties brairded equally well, the new ones being if anything slightly thinner than the Potato oat, but all the new varieties had a much darker appearance that the others. In this respect they very much resembled a crop which had received a heavy dressing of some nitrogenous manure. All through spring and early summer the Tartar King variety seemed to keep the lead in height, being from 3 to 4 inches above the Potato oat on each side of it. Very much the same applied to the other new varieties, only in a less marked degree. A close examination showed that the leaves of the new varieties stood almost erect or at most drooped very little, while the leaves of the Potato oat all drooped, forming a curve of quite half a circle. The difference in height between the new and old varieties was therefore more apparent than real.

The Tartar King variety began to show the ear about two weeks before any of the others, and it was consequently 18 inches or so higher than the others when it attained its full height. In another fortnight they had reached their full length, when all were found to be about the same height —viz., from 4 feet 6 inches to 4 feet 9 inches. The Tartar King ripened two weeks before any of the others, the remaining two new varieties ripening at the same time as the Potato oat.

Each plot was cut by the scythe and stooked well within the borders of its own plot. Each variety was stacked as soon as sufficiently dried, the Tartar King first, the others on 23rd September.

All the varieties were put in one small stack, several sheaves of threshed straw being put between each, not only to separate the one variety from the other, but to gather up any grain which might be shed. All were threshed on 4th February 1899, the produce being once passed through the hand-fanners immediately after. The threshing was done by the ordinary farm threshing-machine, none of the grain being specially fannered or otherwise dressed. The barn floor and fanner-room floors were swept with scrupulous care, under my own supervision, after each lot had been passed through. The same applied to the fannering in the granary, each bag as it came from the

threshing-machine or fanners being labelled so as to avoid mistakes. The results were as follows:—

COMPARATIVE TEST OF OLD AND NEW GRAINS IN 1898

Variety.	Grain.		Weight per bushel in lb.	Notes.
	Dressed oats per acre in bushels of 40 lb.	Light oats per acre in bushels of 40 lb.		
Waverley . .	99	$2\frac{5}{40}$	40	Good fodder straw.
Tartar King	$92\frac{4}{40}$	$2\frac{15}{40}$	42	Secondary fodder straw.
Pioneer . .	$86\frac{7}{40}$	$1\frac{5}{41}$	42	" "
Potato . . .	$61\frac{[illegible]}{40}$	$1\frac{15}{40}$	42	Good fodder straw.

Grain.

The Waverley Oat is much thinner and longer than any of the other three varieties. The husk is also thinner than Tartar King or Pioneer, but owing to its length I am unable to say whether or not it is thinner than Potato. Being a long oat it is lighter per bushel than Potato, but the proportion of grain to husk may not be greater. The grain from none of the plots was either hummelled or specially dressed. If it had been either or both it might have been made several pounds per bushel heavier. The grain from the new varieties was all very much larger in size when grown here than what was sent from England, and when grasped in the hand had a much coarser and rougher feel than what was sent me as seed. While the size of each grain seemed larger, the proportion of husk to grain also appeared greater than in the same grain grown in England.

Two of the new varieties seemed to shed their grain very readily when ripe, or especially when exposed to rain. Pioneer was worst in this respect, closely followed by Tartar King, while Waverley seems to have as firm a hold on the ear as the Potato oat, perhaps a firmer. All the varieties had some loss from this cause, which in future, after knowing the nature of each, might in great part be prevented.

Straw.

The Tartar King has straw very much of the same quality as the old Tartarian oat, and while no better, it might be even worse. It stands fairly well if the weather is not too stormy. In a stormy situation, more especially when ripe, the straw has a bad tendency to break between the ear and the first or second joint, causing the ears to become very much entangled,

and increasing the cost of harvesting. In the west of Scotland, at anyrate, it should be harvested with a considerable tinge of green on the ears.

Pioneer partakes of something of the same qualities as Tartar King, but is fully superior to it for fodder purposes. Waverley has quite a different straw from the previous two, as it seemingly is much better for fodder purposes than either of them. Its straw is more like that of Potato both in quality and length. While Tartar King and Pioneer have straws that in Scotland are called fushionless—that is, deficient in nourishment—that of Waverley seems a good average. No oat will ever become popular in the west and south of Scotland, no matter what its grain-producing qualities are, if its straw is deficient in standing power, feeding properties, or quantity.

General Remarks.

In the carrying out of the experiment of 1898 no hitch of any kind occurred. The land chosen was exceedingly uniform, and the seeding, although a little later than usual, was done in good time. The crop brairded uniformly, and all quite thick enough, although the Potato variety seemed just a trifle thicker than any of the others. All through, the season was very suitable for the oat crop, the yield all over the country being above the average in both quantity and quality, while the harvest in respect to weather was a fair average. The conditions of growth being very favourable from beginning to end, the yield may be looked on as very near the maximum each variety was capable of producing on this land and in this climate. As far as one season's experience goes, the yield may be relied on as showing the comparative producing powers of the different varieties when grown under favourable circumstances.

1899.

As it was decided to issue the 'Transactions' earlier in 1899 than usual, no opportunity was afforded of threshing the crop of 1898 and preparing a report for that year. It was also considered that a one year's test was too short on which to issue a report on such an important subject, more especially when the season was a very favourable one; at the last moment it was therefore decided to repeat, on an extended scale, the comparative test of 1898, and publish the yield of the two years in one report. For this purpose supplies of the following varieties of seed oats were procured:—

1. *Potato.*—Seed from the farm, the produce of new seed in 1898.

2. *Waverley.*—Seed from the farm, the produce of English seed in 1898.
3. *Tartar King.*—Seed from the farm, the produce of English seed in 1898.
4. *Pioneer.*—Seed from the farm, the produce of English seed in 1898.
5. *Yellow Oat.*—English seed. A long oat with a thin skin. A new cross-bred oat of Garton's.
6. *Abundance.*—Seed from Paisley district. Garton's first introduction.
7. *Newmarket.*—Seed from Ayrshire. Variety said to be the same as Abundance.
8. *American Beauty.*—Seed from Prof. Saunder of the Central Experimental Farm, Ottawa, Canada. A new variety which is said to have given excellent results in Canada.

As in 1898 a piece of land uniform in quality was selected. As in the previous instance, the land had yielded two crops of hay in 1898, and had received from 12 to 15 tons of stable manure per acre in October. It was free open soil on a gravelly bottom, being what is called the third terrace of the Clyde valley, and 100 feet above sea-level. The plots extended across the one end of a 20-acre field, and although there are low dressed fences on the south and east sides, and a thin plantation on the west, the position is quite an open and rather exposed one. As the depredation caused by birds is always heavy in this district, particularly near the fences, the trial plots were kept 20 feet from each fence, and, as in 1898, each plot was surrounded by a path 2 feet wide, which was kept fallow. The plots with one exception were a quarter of an acre in extent, the exception being the American Beauty plot, which was one-eighth of an acre, as I had only seed for that area. Each plot was 1 chain wide and 2½ chains long, the varieties being in the following order:—

PLAN OF OAT TESTS.

Tartar King.	Pioneer.	Waverley.	Potato.	Tartar King.	New-market.	Abun-dance.	Potato.	American Beauty.

As the seed about to be used was all larger in size than what it was in 1898, it was decided to set the drill at 4 bushels per acre. A little less than this seemed ample in 1898, and it was thought that 4 bushels would be sufficient under present con-

ditions. The seed was all sound and recently threshed, the land was in good manurial condition, and the tilth was excellent. With the exception of the two outside plots, all the others were sown on 16th March and these on 23rd March.

When fully through the ground it was seen that, with the exception of American Beauty, all the new varieties were more or less thin, two very thin, more particularly at the south end of each plot. The plots of Potato were quite thick enough, that of American Beauty seemed too thick, while Newmarket was exceptionally thin, the others being all on the thin side, but better than Newmarket. As such a variation in the appearance of the braird was not at all expected, and as all the seed was fresh and the land in good order when sown, I began to wonder if the size of the grain of the different varieties used could account for the thinness of the crop. With the intention of probably throwing some light on this point 100 grains of each variety were weighed on a chemical balance, and in order that as accurate an average as possible might be obtained several of the varieties were weighed two or three times. The results were as follows:—

WEIGHT OF 100 GRAINS OF SEVERAL VARIETIES OF OATS.

Variety.	Where grown.	Grams.	Times tried.
Abundance	Paisley	4·510	1
"	Shropshire	3·964	1
"	Canadian	2·859	1
Newmarket	Ayrshire	3·966	1
Tartar King	Newton	4·100	2
"	English	4·123	1
Pioneer (Black)	Newton	4·050	2
Waverley	Newton	4·052	2
"	English	3·370	1
Yellow Oat	English	3·805	1
Tam Findlay (40 lb. per bushel)	Ayrshire	3·100	2
Potato	Newton	2·962	3
American Beauty	Canada	2·865	1

Although a considerable difference was expected in the weight of the grains, no such difference as is here shown was at all anticipated. The above table shows that from single bushels of equal weight and germination as many plants would be obtained from a seeding of 2⅘ bushels of American Beauty, similar to what was tested here, as from 4½ bushels of Abundance similar to the sample from Paisley. In the same way 3 bushels of Potato oat grown on Newton would have yielded as many plants as 4½ bushels of Abundance from Paisley.

The appearance of the brairds of the different varieties was almost a complete corroboration of these figures, with the exception that along the south end of the plots all the new varieties

were thinner than at the other end. My practice here when changing seed grain has always been to get seed off clay land, as it usually yields much plumper grain than seed taken from lighter land, grain grown on my own farm being always very small. In previous years I had often found that new seed did not give such a thick braird as my own, even where sown slightly thicker. I must own that it did not occur to me that there was such difference in the number of grains in a bushel of small grain and large as from 30 to 50 per cent. While I expected and often had more vigorous plants from the large grain, I invariably had the thickest crop from my own grain, but I usually accounted for it in some other way than what seemingly has been the actual cause.

The plot of American Beauty was decidedly too thick, the the two plots of Potato were also rather thick, while the two plots of Tartar King were a little thin, Waverley and Pioneer being decidedly thin, Abundance also decidedly thin, and Newmarket exceptionally thin. Owing to the early date of seeding it was anticipated that the plants on the thin plots might tiller out, and that at harvest there might be as many stalks on these plots as on the thicker-planted ones. This expectation was not, however, realised, and what were originally thin-planted plots continued thin to the end. At 1st June the following was the order of the varieties judged from appearance:—

American Beauty, thick and of good colour.

Tartar King, close on American Beauty in luxuriance but not so thick.

Potato, a good average thickness, but not so far forward as the two previous varieties, nor yet so luxuriant.

Abundance, Waverley, Pioneer, and Newmarket were all behind the others in the order named, their worst fault being their thin appearance.

All the Garton varieties had very dark-green upright leaves, while Potato and American Beauty were of a much lighter green, with gracefully curved leaves.

On 15th July the following notes were made on the crop: American Beauty and Tartar King still seem to keep the lead, the others following in much the same order as on 1st June. Abundance and Newmarket have up to the present shown no difference in any respect, except that the former is more thickly planted than the latter. Tartar King was well in ear, and although all the plots had up to this date looked like producing a very large crop, it now seemed apparent that the plots which were originally thin had not tillered much, and were to be very deficient in stalks. In fact, the thin plots seemed to have a less instead of a greater number of stalks per plant than the thick ones. No attempt was made to systematically count the number of stalks on each root, as such would have given

no definite information, unless where equal areas contained the same number of plants.

It was also noticed that on the thin plots there were a large number of dead or at least red leaves, as if the plants had been attacked by rust. On a closer examination no appearance of rust could be found, and it was thought that the red leaves were in some way the result of the thin crop or the very warm weather of the previous month; or the thin crop might have been the cause of the red leaves. The red leaves continued, however, to increase, and be their cause what it may, they undoubtedly had a detrimental effect on the yield of grain.

About the middle of July it also seemed that the thinnest crops—Abundance, Pioneer, and Newmarket—had not only a small number of stalks per root, but they seemed not to grow the length one would have expected from their appearance.

A considerable number also seemed to have their growth stopped very shortly after coming out of the hose. This peculiarity was common to all new cross-bred varieties, which were thinly planted, not only on the experimental plots, but over two whole fields which had been sown with them. In June it seemed as if the crop would be one of the largest ever grown on the farm, but as the season went on appearances gradually became less promising, and when shooting was fully completed it was easily seen that the crop was to be a small one. Threshing on a pretty extensive scale has now proved this to be not only the case, but the season to be one of the worst, if not the worst for grain, experienced since 1879.

Harvesting began with Tartar King on 17th August, the others following at intervals till 5th September, when the last was cut. Each variety was stacked as soon as it was ready, all being in by 12th September. In 1898 the unthreshed crop could not be weighed owing to rats having burrowed under the balance-weight of the cart weighing-machine and so prevented its working. This was not noticed till it was too late to remedy the defect. To guard against such an unforeseen accident this year, the number of sheaves on each plot were counted, so that some indication might be obtained of the comparative productiveness of each variety in straw. The two plots of Tartar King were stacked before this course was decided on.

NUMBER OF SHEAVES PER ACRE YIELDED BY EACH VARIETY.

Variety.	No. of sheaves.
Pioneer (black)	1072
Waverley	904
Potato (west plot)	1096
Newmarket	640
Abundance	728
Potato (east plot)	1104
American Beauty	992

With the exception of Pioneer, the number of sheaves is a fair indication of the comparative weights of straw yielded by each variety. In the case of Pioneer and other varieties where the straw was shorter than the average, the sheaves were correspondingly smaller in girth, the number being proportionately greater than where the straw was longer. Stacking was carried out as in 1898. Threshing was done in the middle of December, the produce of each plot being carefully weighed on the cart weighing-machine before delivery to the threshing-machine. After threshing the weight of grain was deducted from that of grain and straw combined, the difference being reckoned as straw and chaff. While threshing was in progress a small handful of threshed straw was pulled two or three times from each sheaf as it was being collected behind the threshing-machine. From the quantity of straw on each plot these handfuls amounted to a full-sized sheaf, which as soon as completed was tied up, labelled, rolled in sacking, and sent off to Dr A. P. Aitken for analysis. As in 1898 the produce of each plot is this year calculated at the bushel of 40 lb., although it might be more or less, the actual weight per bushel being, however, also given. In every case the weight per bushel was over 40 lb. in 1898, while this season, with one exception, all are under it, several being exceptionally low.

TABLE SHOWING THE PRODUCE OF EACH VARIETY OF OATS FOR SEASON 1899.

Variety.	Straw per acre.			Per cent of straw to grain.	Grain in bushels of 40 lb.		Per cent of grain to straw	Weight per bush. in lb.	No. of plots tested.	Size of each plot tested.
					Good	Light.				
	T.	cwt.	lb.							ac.
Tartar King . .	1	5	26	63·1	$39\frac{4}{40}$	$2\frac{5}{40}$	36 9	41	2	[illegible]
Potato . . .	1	18	56	72 6	$39\frac{5}{40}$	$1\frac{1}{40}$	27·4	37	2	[illegible]
Abundance .	1	9		64·6	40	$3\frac{1}{40}$	35·4	36	1	[illegible]
Newmarket .	1	1	84	69·6	21	$2\frac{34}{40}$	30 4	35	1	[illegible]
American Beauty	1	12	32	64·1	$41\frac{21}{40}$	$5\frac{10}{40}$	35·9	37	1	[illegible]
Waverley . .	1	11	102	65·8	$42\frac{18}{40}$	$4\frac{2}{40}$	34 2	35	1	[illegible]
Pioneer [1]. . .	1	11	70	70 3	36	$1\frac{15}{40}$	29 7	33	1	[illegible]
Yellow oat [2] . .	1	9	56	65 7	43	$6\frac{12}{40}$	34·3	33	1	[illegible]

[1] In order to prevent the small plots from becoming mixed when being threshed, none of the grain at that time was passed through the hummeller, but since the above table was drawn out, Pioneer has been hummelled and properly dressed prior to sale, and it has weighed 40 lb per bushel. It is presumed that when the others have been similarly dealt with an improvement in bushel-weight will be attained.

[2] The Yellow oat was in a separate field from the others. It also suffered from being thin from worming, not from thin seeding.

All the varieties are this year very disappointing, not only in the quantity but also in the quality of the grain. The phenomenal yield of the new cross-bred varieties over the old ones,

which was so noticeable in 1898, is entirely awanting in 1899. The thin seeding and the adverse climatic influences, whatever these may have been, have apparently been detrimental to old and new varieties alike, and have reduced all to very much the same level.

Potato oat has fallen from 61$\frac{3}{4}$ bushels per acre in 1898 to 39$\frac{1}{5}$ bushels in 1899 = 36·5 per cent.

Pioneer has fallen from 86$\frac{1}{3}$ bushels per acre in 1898 to 36 bushels in 1899 = 58·3 per cent.

Tartar King has fallen from 92$\frac{1}{3}$ bushels per acre in 1898 to 39$\frac{1}{7}$ bushels in 1899 = 57·7 per cent.

Waverley has fallen from 99 bushels per acre in 1898 to 42$\frac{1}{2}$ bushels in 1899 = 57·8 per cent.

It is somewhat remarkable that all the new cross-bred oats have fallen at such a uniform rate—viz., 58·3, 57·7, and 57·8 per cent—while the old Potato oat fell only 36·5 per cent. Part of the fall of the new varieties was in all likelihood due to the thinness of the crop, but it is impossible to speak definitely on this point till greater experience has been gained. At the time when the crop brairded the new varieties were no thinner than many crops which are slightly damaged by worms, and which yet ultimately produce a full crop. Had it not been for the uniform thickness of the American Beauty and Potato varieties, it might have been suspected that part of the thinness at one end of the plots was due to worming, but unless it can be proved that the worms would not or could not destroy these varieties, such a view cannot be entertained.

Straw.

Judging the varieties from the experience of the past two seasons, and taking the Potato oat as a standard, Abundance and Newmarket seem to produce straw as long as, if not longer than, the Potato oat. It is, however, of such a brittle, fushionless nature that it lodges readily, and is not nearly so good for fodder as Potato straw.[1] Tartar King has straw which in many respects resembles Abundance. With me it has, however, always stood up well, but it seems to have a tendency to break when exposed to strong winds. If exposed to much wet weather after cutting it becomes very brittle, and in passing through the threshing-machine a large proportion of the straws get broken.

The straw of Pioneer (black) is an improvement on that of Tartar King, Abundance, or Black Tartarian, although even that is not saying very much for it, but in point of firmness it cannot compare with the Potato oat.

Waverley and American Beauty have somewhat the same

[1] See Dr A. P. Aitken's report on the analyses of the straws, p. 236

class of straw. In 1898 the straw of Waverley was equally as long as that of Potato, and although carrying almost double the number of bushels of grain per acre, it stood up as well as Potato. The straw of both Waverley and American Beauty seemed not to break to the same extent as Abundance or Tartar King, and while both stood equally as well as Potato, they had a very much softer feel when grasped in the hand. Waverley grows about the same length as Potato, but American Beauty, at least in 1899, was much shorter than either of the other two.

The Yellow oat seems to have a firm useful straw, likely to be easily handled by the binder, and apparently of good feeding quality. Unlike several of the other new varieties, it has little tendency to shed its grain, even under adverse circumstances, and on this account it may be specially useful for exposed situations. The attachment of the grain to the straw is so strong that it is more than usually difficult to thresh. Although it is very light per bushel, I have a good opinion of this oat, and I think that with a different season it may yet turn out a very useful variety, both in regard to grain and straw.

While the trial, extending over two years, has given what might be called maximum and minimum results, from a comparative point of view, I look on those of 1898 as being the more reliable of the two, the deficiency in 1899 not being the result so much of climatic influences as of management.

The results of the analyses by Dr A. P. Aitken are given on p. 237. On these analyses Dr Aitken makes the following remarks:—

"In the upper part of this table are given the analyses of the ten samples of straw as they were received, and it is seen that they differed a good deal in the amounts of moisture. Whether these differences were due to the character of the seed, the condition as to ripeness, or to differences in the soil of the various plots, or probably to what may be called accident, I do not know. Well-ripened and well-won straw should contain only about 14 per cent of moisture, so these are all wet samples. Seeing that the differences are so considerable, and that they are probably not inherent in the quality of the straw, it would be safer in discussing them to neglect the moisture altogether and compare the results of the thoroughly dried samples as given in the lower half of the table.

"The first column shows the amounts of albumen, a very valuable constituent from a feeding point of view, and one in which straw is notably deficient. It is usual to estimate the feeding value of fodders according to the abundance of albumen and amides they contain, and the proportion which these bear to the other constituents—viz., the fat, carbohydrates, and vegetable fibre—and when fodders of a like kind are being compared there

ANALYSES OF THE STRAW WITH THE MOISTURE AS RECEIVED.

Samples.	True albumen.	Amides, &c.= albumen.	Total nitrogen	Oil, &c. (ether extract)	Carbo-hydrates.	Fibre.	Moisture.	Ash.
Abundance	1·82	·91	·43	1·91	43·94	29·21	16·80	5·41
Pioneer	2·93	·51	·55	1·73	40·60	28·22	21·20	4·81
American Beauty	2·52	·36	·46	1·91	43·73	28·92	17·60	4·96
Tartar King, from centre of field[1] . .	2·91	·72	·58	1·87	42·15	30·05	16·80	5·50
Potato	1·81	·72	·40	1·91	40·26	33·26	17·20	4·84
Newmarket	2·51	·90	·54	1·84	43·54	27·83	18·00	5·38
Waverley	2·09	·35	·39	2·53	42·50	28·16	20·00	4·37
Tartar King, experimental plot	1·82	72	·40	2·12	45·64	26·20	16·80	4·70
Tartar King, bottom of field[2]	1·87	·36	·35	1·92	45·32	29·71	14·80	6·02
Yellow oat	3·37	·35	·59	1·99	42·87	26·87	18·80	5·75

ANALYSIS OF THE STRAW CALCULATED AS DRY.

Samples.	True albumen.	Amides, &c.= albumen.	Total nitrogen	Oil, &c. (ether extract)	Carbo-hydrates.	Fibre.	Moisture.	Ash.
Abundance	2·19	1·09	·52	2·30	52·82	35·10	...	6·50
Pioneer	3·72	·65	·70	2·20	51·53	35·80	...	6·10
American Beauty	3·06	·44	·56	2·32	53·06	35·10	...	6·02
Tartar King, from centre of field[1] . .	3·50	·87	·70	2·25	50·66	36·12	...	6·60
Potato	2·19	·87	·49	2·30	48·62	40·17	...	5·85
Newmarket	3·06	1·10	·66	2·25	53·10	33·92	...	6·57
Waverley	2·62	·44	·49	3·17	53·12	35·20	...	5·45
Tartar King, experimental plot	2·19	·87	·49	2·55	54·84	31·50	...	8·05
Tartar King, bottom of field[2]	2·19	·43	·42	2·25	53·19	34·87	...	7·07
Yellow oat	4·16	·43	·73	2·45	52·79	33·10	...	7·07

[1] Had the same exposure to weather as the experimental plot, but was grown on firmer land.
[2] Had the same exposure to weather as the experimental plot, but was grown on gravelly land.

is no great objection to that method. It is seen that the yellow-oat straw easily takes the first place; not only does it show the highest proportion of albumen and amides taken together, but the proportion of albumen to amides is about 10 to 1, which shows that the straw has been well ripened. Pioneer straw takes the second place, but in it the proportion of albumen to amides is about 6 to 1, showing that it has not been so well ripened; and the third place is taken by Tartar King (from the centre of the field), but in its case the proportion of albumen to amides is only about 4 to 1. It is evident, however, that deficient ripening of the organic matter of the straw is not a quality dependent on the strain of seed alone, for the same seed (Tartar King) grown on the experimental plot is about the least ripe of all. Clearly the nature of the soil has a far greater influence on the relative proportions of albumen and amides than the strain of the seed, and unless we were assured that the soil on which the various seeds were sown was as perfectly uniform as can be attained in the open field—and Mr Speir assures me that such was the case—we are not justified in making ripeness a basis of comparison in such a case as this, where only the relative value of seed is under consideration. The Society's experiments at Pumpherston showed very distinctly that the amount and kind of nitrogenous matter in the soil had a great effect in determining both the total and relative amounts of albumen and amides in the crops, and it is evident that such experiments would require to be repeated in several places on the same field in order to enable any just inferences to be drawn as to the degree in which the kind of seed affects the nitrogenous constituents of straw and its feeding properties.

"I think it probable that we are on safer ground in comparing the relative amounts of fibre as indicating the strength of the straw, though even in this respect the three plots of Tartar King show marked differences. The straw of the Potato oat is distinguished by its relatively large amount of fibre, and we may infer from that its greater toughness and resistance to lodging; but in this regard also it would be rash to make a definite statement in the absence of the confirmatory testimony of duplicates grown under similar conditions.

"It must also be borne in mind that in comparing the quality of these samples of straw, the results obtained, even under the most satisfactory conditions, must be considered in conjunction with the amount of produce per acre in order to arrive at a fair estimate of the relative value of the seeds as fodder producers."

THE HORSE'S FOOT, AND HOW TO SHOE IT.

By Principal Dewar, Royal (Dick) Veterinary College, Edinburgh.

Notwithstanding the care and attention that have been given to the improvement of the various breeds of horses, some of our agricultural societies have passed their centenary before they have devoted much time to the consideration of how the shoeing of the horse could be improved. Considering the importance of the subject, requiring, as it does, a correct understanding of the principles which should guide the artisan in the various operations in connection with the art, and an experience and skill in the manipulative details which can only be acquired after years of careful study and practice, this is not a little surprising.

One requires but a glance at the busy thoroughfares of our large towns to be able to appreciate the importance of the horse in modern civilisation; and that the full value of the animal may be realised, the possession of good healthy feet, protected by suitable, well-applied shoes, is absolutely essential. In these days of motor-cars, bicycles, and tricycles, propelled by steam, electricity, and other forces, we are continually being warned that horses will soon be at a discount,—that in a few years mechanical contrivances will supersede the horse in the great majority of purposes for which his services are now utilised, and that a great check will be given to the breeding and rearing of horses. This is only a repetition of the pessimistic prognostications so often heard on the introduction of the locomotive steam-engine and the building of railways. But the effect has been quite the reverse. The number of strong powerful horses required in connection with our great railway system is to-day greater than ever. And notwithstanding the introduction of light "motors," the well-bred horse will still be in demand. He will be an easy first in the hunting-field. A good horse will never go out of fashion. Realising, then, the importance of the horse in the commerce of our country, it may be profitable to consider how he may be best adapted for use on our macadamised roads and granite-paved streets.

Although in some semi-civilised countries horses are used unshod, it is only where the roads are merely tracks on the surface of the ground—on the prairie or veldt—and where, when the hoofs are worn out, the horse can be laid aside until they grow again sufficiently to protect the sensitive tissues.

"No foot, no horse," has come to be an aphorism, indicating

that a horse with bad feet is valueless. And this is not a modern discovery. Xenophon wrote, more than two thousand years ago, "In examining a horse look first to the legs, and in examining the legs look first to the feet," and that was hundreds of years before the method of attaching the shoe to the hoof by nails was introduced. The ancients, therefore, seem to have been as fully alive to the importance of good feet in their horses as we are at the present day.

Writing in an agricultural publication, and more for breeders and agriculturists than for horse-shoers, it will not be necessary to enter into the minute anatomy of the foot, nor into manipulative detail so fully as would be expedient in the latter case. But it is desirable that every breeder and owner of horses should have an intelligent appreciation of the subject with which we are dealing. We will therefore consider briefly:—

The Anatomy of the Foot—The Bones.

As the obliquity of the pasterns, and to some extent that of the foot, depends on the angle formed at the fetlock by the two articulating bones, we observe that the cannon or metacarpal bone—the large bone of the leg—extends from the knee to the fetlock, and occupies a perpendicular position. It terminates at the fetlock in two convex surfaces separated by a median ridge, which are adapted to articulate with the superior extremity of the next bone—the os-suffraginis or long pastern bone (fig. 122).

On the posterior aspect of the lower extremity of the cannon-bone two sesamoid bones are attached, one on each side of the median ridge. They are held in position by ligaments, and form part of the fetlock joint. Their use is mainly for the attachment of ligaments in such a manner as to form a stronger brace, stay, or support to the fetlock than could be found without their assistance, and to act as a pulley for the flexor tendons to play over.

Below the fetlock there are three main bones or phalanges. The first phalanx, the os-suffraginis or long pastern, about one-third the length of the metacarpal bone, has its upper extremity expanded and adapted to articulate with the latter. The lower extremity, very much smaller, articulates with the next bone—the os-corona or short pastern—forming the pastern-joint.

The os-corona, second phalanx, or short pastern, is a somewhat cubical bone, about as broad transversely as its vertical length, and articulates below with the os-pedis or coffin-bone, the joint formed by the junction of the two being within the hoof.

The os-pedis, coffin-bone, or third phalanx, entirely situated

within the hoof, is an irregular bone, somewhat pyramidal in shape. Its anterior, lateral, and solar surfaces follow closely the shape of the hoof, which may be said to be moulded on this bone. The alæ or wings, one on each side, project backwards like the horns of a crescent, their upper edges giving attachment to the lateral cartilages, which may be considered firm but elastic extensions of the bone upwards and backwards, serving to preserve the form and stability of the foot. When ossified and

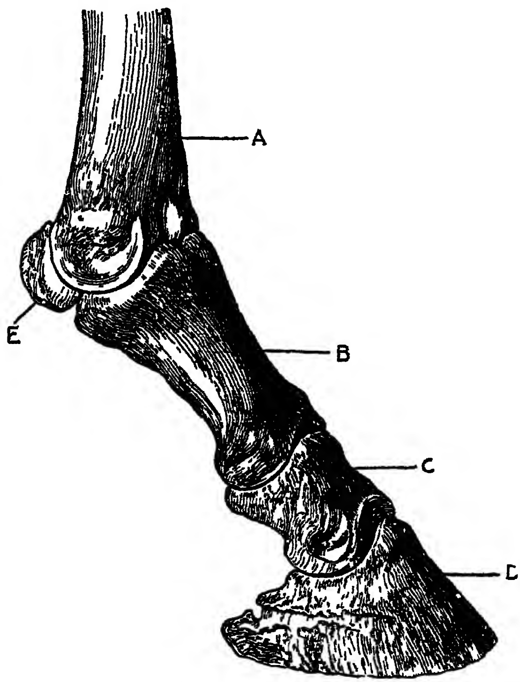


Fig. 122.—*Bones of the fetlock, pastern, and foot.*

A Cannon or metacarpal bone.
B Os-suffraginis or long pastern bone
C Os corona or short paste bone.
D Os-pedis or coffin-bone.
E Right sesamoid bone

enlarged, these cartilages are known as "side-bones," a disease only too common in heavy horses. On the upper and posterior aspect of the bone is the articular surface adapted to fit the corresponding surface of the os-corona. The navicular bone is a small sesamoid bone situated with its long axis transversely, above and behind the os-pedis, and articulating with it, but mainly with the os-corona. The use of this bone is principally to act as a pulley to the perforans, the strong flexor tendon of the limb. It increases the leverage and enables it to act with

more power. The bone is smooth on its postero-inferior surface for the broad strong tendon to glide on, the tendon being then almost immediately inserted below into the semi-lunar ridge on the postero-inferior aspect of the os-pedis.

It may be observed that while the bones between the elbow and the fetlock joints form a straight perpendicular line, those we have considered, the three phalanges, extending from the fetlock to the ground, also form a nearly straight but oblique line in a well-formed limb, the obliquity varying in different animals, depending greatly on the breed.

The bones in the hind-limb below the hock are very similar, but slightly longer, a little narrower from side to side, but deeper from before backwards.

Joints and Ligaments.

The joints that have been referred to—the fetlock, the pastern, and the coffin joint—are all practically hinge joints, permitting only of the movements of flexion and extension, only a very little lateral movement being possible (fig. 123). They are all well knit by powerful ligaments, the most important being the suspensory ligament, rupture of which constitutes "breakdown." It arises from the lower part of the back of the knee, passes down between the two splint-bones, divides above the fetlock, and is attached on each side to a sesamoid bone. It then passes round the sides of the limb and becomes attached in front to each side of the extensor-pedis tendon above the pastern joint.

The Blood and Nerve Supply.

The foot is a very vascular organ, and is very well supplied with blood. The artery which conveys the blood down the leg divides above the fetlock, a branch passing down each side of the pastern, where they are known as the plantar arteries. These break up into several branches, the interior of the coffin-bone being particularly rich in blood-vessels. They terminate in capillaries, the blood being returned by satellite veins.

The nerves mostly follow the course of the arteries, breaking up after reaching the fetlock into several branches, the posterior of which is the largest and accompanies the main artery. It is almost superfluous to say that the foot is a very sensitive organ, —the prevalence of foot lameness, and the intense pain caused by any injury or inflammation within the hoof, being matters of common knowledge.

The Hoof-Development.

The hoof, the principal organ in connection with our subject, may be considered an epidermal appendage. That is to say, it is formed from the epidermis or scarf-skin at the coronet or top

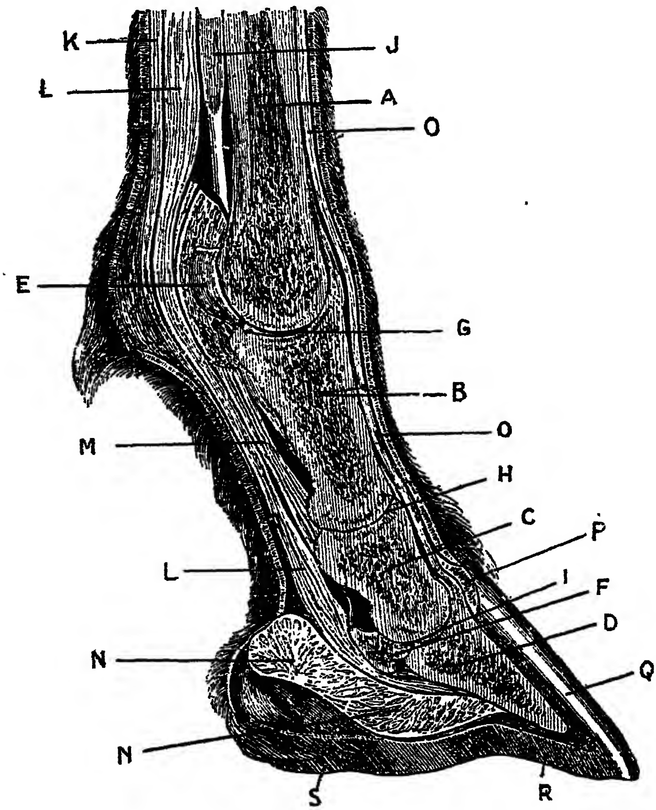


Fig. 123.—*Vertical median section showing joints, ligaments, &c.*

The letters A, B, C, D, and E have the same meaning as in fig. 122.
F Navicular or shuttle bone.
G Fetlock joint.
H Pastern joint.
I Coffin joint.
J Suspensory ligament.
K Flexor-pedis perforatus tendon.
L Flexor-pedis perforans tendon.
M Inferior sesamoidean ligament.
N Plantar cushion or fatty frog.
O Extensor-pedis tendon.
P Coronary band or cushion.
Q Wall of hoof.
R Sole of hoof.
S Horny frog.

of the hoof. The epidermis is the outer layer of the skin, overlying the corium or true skin. In it again two layers can be recognised—an outer or horny layer, which is constantly being shed as scurf or scales, and a deeper layer, the rete mucosum,

formed of actively proliferating cells. From this layer hair, horn, and hoof are developed. Immediately below, where the growth of hair stops, there may be seen, when a hoof is soaked in water, or after a horse has been wading in deep snow, a narrow white or light-coloured band, which passes all round the top of the hoof. This band is known as the periople, and from it a thin film of horn is developed which serves as a covering or skin to the hoof. This covering is very important, assisting in preserving the strength, toughness, and suppleness of the horn. Being comparatively waterproof it serves to prevent the soaking of the horn when long exposed to moisture, and the too rapid drying, which leads to brittleness, when exposure to wet is followed by heat and drought.

When a hoof is removed from a foot there can be seen, just beneath the periople, a broad, massive-looking ring extending round the foot. This is the coronary band, from a half to one inch broad, and convex outwards and downwards. It is studded with papillæ — velvety-like projections — from which are developed the main mass of the horny wall.

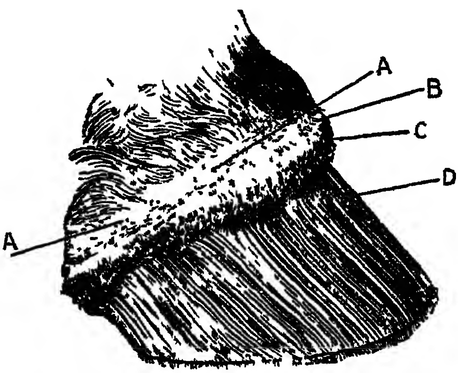


Fig. 124.—*Foot from which the hoof has been removed to show the laminæ.*

[illegible]

Below the coronary band a very different-looking structure is to be seen. A large number of parallel leaves extend downwards and forwards from the coronary band to the ground surface (fig. 124). These leaves are known as the sensitive laminæ, and are closely set around the front and sides of the foot. They curve round the heels extending inwards and forwards to form the bars, terminating some distance behind the point of the frog. These laminæ are longest and most closely packed on the front of the foot, decreasing in length and closeness along the sides and bars, and number from 500 to 600. They interdigitate with the horny laminæ, forming a very close bond of union which, owing to the digitations, has been estimated to extend over a surface of 10 to 12 square feet—*i.e.*, in a single foot. So intimate is the connection that nothing but the most extreme violence will disturb it as long as it remains healthy.

The ground surface of the foot or sensitive sole is thickly covered with papillæ very similar to those on the coronary band, and no laminæ are visible except those at the bars. The sensitive frog is also covered by papillæ somewhat longer than those on the sole. Above the sensitive frog and between it and the centre of the foot is the plantar cushion—a thick mass of fibro-elastic material which, along with the horny frog, serves to diminish concussion during rapid movement when weight is thrown on the limb.

From these superficial structures, mainly derived from the rete mucosum, the horn of the hoof is developed, the horn taking the place of the outer layer of the cuticle or scarf-skin. The corium or true skin also extends over all the foot, and through its blood-vessels supplies the nutriment necessary for the development of the horny laminæ, the sole, and the frog. The horn of the wall of the hoof—all that is coloured of it in a dark hoof—grows from the coronary band, and in a normal hoof takes from eight to twelve months to grow from the coronet to the ground surface. It grows from the papillæ in the form of tubes lying parallel and filled and cemented together by a horny substance. Inside this horn is a white line, even in dark hoofs, which can be seen on the ground surface indicating the junction of the sole and wall. The horn of the sole is developed from the papillæ covering the sole, is less fibrous, less tough in its texture, contains more cementing material, soon loses its vitality, and is shed naturally in flakes, while the wall of the hoof requires to be worn by attrition or removed artificially. The horn tubes of the frog are more wavy, more sinuous, the intertubular or cementing material is softer and more waxy in its nature, and altogether it is loose in its texture, but very tough and resilient.

Care of the Growing Hoofs.

When a foal is born the walls of the hoofs have all the appearances of mature horn. But the soles are convex, composed of a substance having more the appearance of a stiff, tough jelly than horn, and with very little resemblance to their ultimate form and texture. But in the course of a week or two this disappears, and they acquire more the form of immature hoofs.

As a rule, under natural conditions, the feet of the foal require no attention while running with its dam. But occasionally, especially when on bare, rocky, or gravelly pastures, or when the fore-legs are longer proportionately than the head and neck, so that the foal has difficulty in getting down to eat, the hoofs of the fore-feet get worn away in front, sand and dirt find their

way in at the white line, act as a source of irritation, inflammation is set up, and the little animal becomes acutely lame. In order to prevent this the foal should be carefully watched, and if it is observed that it has difficulty in getting down to feed, that while doing so it stands on one fore-leg, the other being widely extended out in front and to a side, inordinate wear of the hoofs should be looked for. But if this is occurring from any cause the foal should at once be shod with tips. These tips should be made very light, thickest and broadest at the toe, becoming thinner and narrower in the branches, and terminating at the quarters without coming under the heel of the hoof at all. The hoof requires to be prepared with knife and rasp, and the tip bedded in the same way as a shoe, so that the heels of the hoof and the ends of the branches are about level. It is very unusual for the hind-feet to require any attention of this kind. In many cases no shoes will be required. The foot is most worn at the toe and becoming too upright; but by reducing the heels with knife and rasp, and bringing the foot to a more natural level, the condition may be remedied. It is seldom that the frog requires any dressing except the removal of loose or ragged horn.

But supposing that the feet of the foal has required no attention, as it grows the growth of the hoofs frequently exceeds the natural wear. This is more likely to be the case when the colt is running in a meadow or in soft arable pastures, and in severe weather confined to a straw-yard. If not attended to the hoofs are apt to assume an abnormal form—to turn outwards or inwards.

Pigeon-toed.

In colts that have had some difficulty in getting down to graze when foals, the hoofs often turn inwards, the internal wall of the hoof growing longer, as it is not worn away so much as the external. This leads to the colt acquiring a pigeon-toed appearance. To prevent this the colt's hoofs should be looked at from time to time, and any tendency for one side to grow deeper than the other should be met by the knife and rasp. Even if not growing awry, but only insufficiently worn, the wall when looked at from the ground surface projecting by itself considerably beyond the level of the sole, the rasp should be applied all round to approximate the level of the wall more nearly to that of the sole. But the wall ought always to extend a little below the level of the sole. Very often while the hoof grows too long at the toe it becomes worn and broken away at each side, so that the toe is left projecting. In this form

there is a risk of the toe breaking off too short into the sensitive tissues and causing lameness. Before this can take place, therefore, the foot ought to be dressed and the toe shortened.

In the event of the feet of the colt being neglected until the deformity is greater than can be remedied by removing the overgrown horn on one side of the hoof,—and this occurs once the balance is upset, by the greater part of the animal's weight being thrown on the short side of the hoof, so that it gets nearly all the wear, and may be worn away farther than it ought to be,—the animal must be shod. Unfortunately very few of our horse-shoers, although in general excellent workmen, have sufficient knowledge of the mechanism of the horse's foot, and the principles on which deformities ought to be remedied, to do this efficiently without some advice and guidance; and as a rule the assistance of the veterinary surgeon should be obtained. In this case—overgrowth of the internal wall of the hoof and inordinate wear of the external—he will advise a shoe to be applied, after the hoof has been dressed as well as possible, with the external branch stronger and thicker than the internal and coarsely fullered, so that the shoe may project slightly from under the hoof on the outside.

The risk of tearing off the shoe, from other horses treading on it, &c., may be greatly diminished by bevelling off the upper and outer edge of the outside branch of the shoe. Two shoeings in this manner are sufficient to correct in growing colts all but the most extreme defects of this kind.

Lady-toed.

But the deformity often takes the opposite direction, the outside wall of the hoof being much longer than it ought to be, the inside wall shorter. This tends to result in the condition known as "lady-toed." The same principles must be adopted. After the disparity has been remedied as far as possible by dressing the hoof, a shoe is applied, with the inside branch thicker and stronger than the outside; but it cannot be allowed to project far from under the hoof on the inside owing to the greater risk of the animal treading it off with the opposite foot, and striking the opposite leg with it.

Bow-hocked.

In connection with what may be considered deformities, it may be observed that colts that go wide behind, too wide between their hocks, can often be cured if attended to early, while

the animal is growing and developing. By applying a shoe with a broad strong outer branch and a thick square heel, a satisfactory improvement is often obtained (fig. 125). The outer branch should be set wide at the heel, and be sufficiently broad and strong to support the wall as well, the bearing surface being broad and quite level. The calkin should be thick, square, and of medium height, sloping outwards towards the ground rather than inwards; while the inside heel is left without a calkin, or if one is set up, it must be considerably lower than the outer one. Repeated careful shoeing in this way usually gives fairly satisfactory results as far as the appearance of the hocks are concerned.

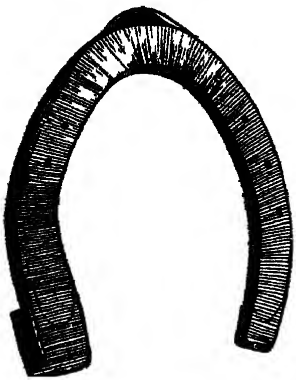


Fig. 125.—*Shoe with strong thick outer heel for bow hocked colt.*

Broken and Brittle Hoofs.

Apart altogether from deformity or unequal wear, the hoofs are apt to be broken away, often unequally, at the lower border of the wall, so that the colt becomes lame, or at least tender on his feet. Several causes contribute to this. Owing to domestication the colt is not allowed to roam at will over a large tract of country, but is generally confined to a field.

When in a soft moist field the growth of the horn is favoured, and the wear is materially diminished. If the colt is now, after the hoofs are well grown, removed to a dry, rocky, or gravelly field where the herbage is in parts scanty and the stony soil showing through, without the hoofs having been attended to and rasped down, they are very apt to be broken, and when broken to be broken off too short and very irregularly. Or if in a large field or outrun where the food is scanty and the rocky stony soil considerably exposed, the hoofs may be worn down without much breaking until the feet become tender. But this is not common.

Grass-Rings.

Another cause which tends to impair the quality of the hoofs is the exposure of colts in all weathers. Although our climate is a temperate one, yet sudden changes are very common, and a soaking wet stormy night, with a fall in the barometer of from

20° to 30°, has a very prejudicial effect on animals exposed to it. The effect of this on the hoofs is seen in the appearance of parallel rings, usually known as "grass-rings," running round the hoofs parallel to the coronet,—a stormy wet cold night being sufficient to account for a ring. This interferes in some degree with the continuity of the quality of the hoof, and renders it more liable to break. These rings, however, may be considered harmless compared with those due to "laminitis" or "founder," and may be distinguished from the latter by being parallel, while those due to "founder" are widest at the heels, narrowing towards the front of the hoof.

There is little doubt also but centuries of shoeing of adult horses has served to impair the quality of the hoofs to some extent. When any organ is not used or not required its usefulness soon becomes impaired, and although it cannot be said that the hoofs of shod horses are unused, yet they are not used to the same extent as are unshod ones, and the ability to go without shoeing will be diminished in the course of ages.

But from whatever cause, when the walls of the hoofs are worn or broken away until the sole becomes prominent, it will be necessary to get the colt shod. And as with the foal, except in very unusual cases, tips will be sufficient. They require to be stronger, even proportionately, than in the foal, but applied in the same way. If from any cause, as from injury to a heel, it should be necessary to apply a shoe instead of a tip, the shoe ought to be light, narrow, and not any thicker at the heel than at the toe. It should also follow pretty closely—not project far beyond—the outline of the hoof, even at the heels.

There is no doubt but a great many colts would be better to be shod in this way. It protects the hoofs, permits of their equal growth and expansion, and enables the colt to be more satisfactorily shod, and more at home on his shoes when required for work. Worn and broken hoofs are often treated by finding a soft, marshy, or at least moist field to turn the colt into. There is no doubt but moisture favours the growth of the hoof, while the soft yielding soil, by being pressed into the sole, into the lacunæ or clefts at the sides of the frog and back towards the heels, during progression, by the animal's weight assists materially in causing expansion of the hoof. And although this takes place to some extent with the sacrifice of quality, still it is much better than an insufficiency of horn.

Conformation or Shape of Hoof.

The horse is a native of dry warm countries, and he thrives best under these conditions. The feet of Arabian and Persian horses are comparatively small, but the hoofs are of good

quality, tough, hard, and durable. In low-lying, moist, colder countries the feet tend to become larger, to expand from constant moisture, but they become weaker, the horn soft, of an inferior quality, and loses its cohesiveness.

The thoroughbred horse in our own country, descended in great part from the Arabian, and carefully bred and tended for generations, has usually well-formed upright feet.

The hackney also, which is mostly indebted to the thoroughbred for his finer qualities, has usually good well-formed feet.

These may be compared with the underbred draught horse, reared on a flat, moist, low-lying district. His feet grow rapidly, the hoof expands, its obliquity increases, the heels become lower, and the increase in size is gained at a sacrifice of quality, strength, and utility. Too large a foot is a bad characteristic in any horse, but especially in a horse used for fast work. It is generally deficient in quality,—it requires a heavier shoe, a

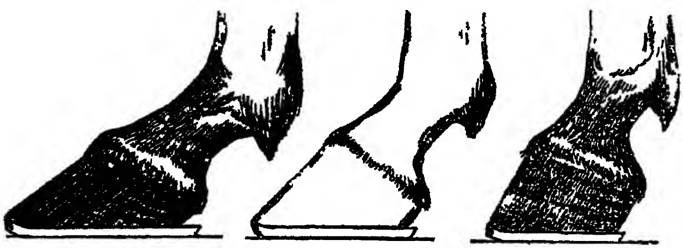


Fig. 126.—*Flat foot.* Fig. 127.—*Well-shaped foot.* Fig. 128.—*Upright or stumpy foot*

In fig. 127, pastern and hoof are both represented rather too oblique

greater effort to lift it, the horse is more liable to brush and strike the other leg with it, and to tread on the shoe of the opposite foot and tear it off.

Too small feet are also objectionable. The walls are usually thin, are apt to dry and become brittle, consequently the fastening on of the shoe becomes a work of some difficulty. The width of the ground surface—the base area—is too small for the height of the column it has to support; therefore with a small foot the pastern and fetlock joints are more exposed to twists and strains than with a larger one.

The conformation or shape of the hoof is of the greatest importance (figs. 126, 127, and 128). Looked at from the front, a well-formed hoof resembles a section of a cone, but the obliquity is slightly greater on the external than on the internal aspect. Viewed from the side, it has more the form of a section of a cylinder, cut obliquely at the ground surface, but nearly at right angles at the coronet.

In a well-formed fore-foot the angle at the toe is about 50°, certainly not under that—in a hind-foot it is at least 55°; but the obliquity of the wall (fig. 127) diminishes rapidly as it passes backwards, more rapidly on the inside than the out, until, as it approaches the heels, it passes the perpendicular and slopes downwards and inwards.

On carefully examining the solar surface of a hoof, we find that the wall is thickest and strongest at the toe, becomes gradually thinner as it passes backwards, again slightly thicker

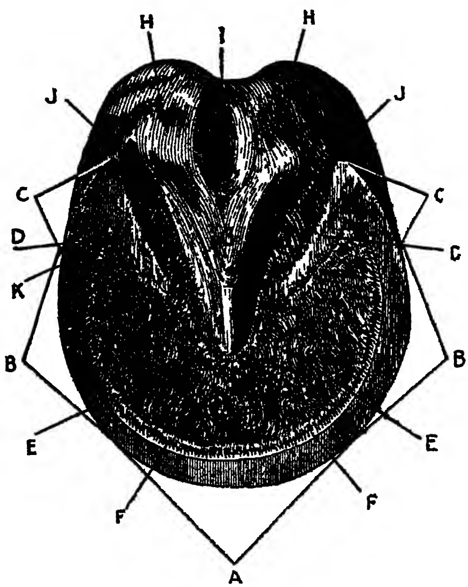


Fig. 129.—*Right or off fore-foot.*

A Toe.
B Quarters.
C Heels.
D Bars.
E Sole.
F White line.
G Frog.
H Bulbs of the frog.
I Median lacuna or cleft of the frog.
J Lateral lacunæ or clefts.
K Seat of corn.

at the heels and as it turns round to form the bars. The thinnest part of the wall is towards the posterior part of the inner quarter. Comparing the solar surface of a well-formed fore-foot with a hind one, the fore-foot is more circular, the sole not so concave; it is a little broader, but rather narrower at the heels, and the frog shorter but larger (fig. 129).

The hind-foot is longer, more oval in shape, the sole more concave, the frog longer but less bulky, does not come so much in contact with the ground, and the heels are rather wider (fig. 130). Viewed from the front on a level surface, the external

wall of the hoof is seen to be considerably more oblique than the internal, the difference between the two sides being greater in the hind feet than in the fore.

Colour of Hoof.

The colour of the hoof depends on the presence of pigment in the tissue from which the hoof is developed. Hoofs of a dark grey or dark slate colour are considered least liable to defects and disease. Light-coloured hoofs are considered weaker than dark.

Elasticity of the Foot.

In the natural healthy foot there is a considerable amount of elasticity. The long oblique pasterns of the well-bred horse allows the elasticity of the soft tissues to come into play, and the shock or concussion is thereby greatly diminished when the foot comes suddenly in contact with the ground. But the elasticity of the foot also aids in diminishing concussion. As soon as the foot comes in contact with the ground the weight of the body presses on the pedal bone, displacing it downwards and backwards, and it is accompanied by the os-corona and navicular bone. These press on the plantar-cushion, frog, &c., the pressure in the unshod foot being opposed below by the hard ground. Compressed above and below they must expand in some direction, and it is found that expansion, while taking place backwards also takes place laterally. This lateral expansion is not great, but its effect can easily be seen on the bearing surface of a worn shoe, where a bright groove becomes channelled out by the to-and-fro action of the lower border of the wall.

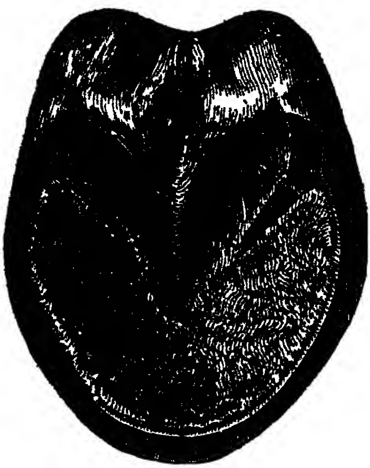


Fig. 130.—*Right or off hind foot.*

This movement is so slight and so far back that the nails scarcely interfere with it, but it teaches that the bearing surface of the shoe ought to be perfectly level, and not sloped inwards as it is very frequently, thus tending to that contraction of the heels which is so undesirable a feature in a hoof.

Protection of the Feet.

We have seen that notwithstanding the hardness, toughness, and durability of the hoof, its rapid growth, and suitability of purpose on its natural pastures, it is found that under domestication the very best hoofs will not stand the constant wear and tear of our macadamised roads and paved streets, so that means must be used to protect them.

In some countries at the present day the horses are not shod, but these are mostly warm dry countries, where the hoofs are naturally harder and tougher and tend to become smaller and more upright. They are, therefore, better fitted to withstand the constant attrition on the natural roads mostly to be found in those countries, or even on the worn paths and tracks, than the softer and larger hoofs of the horses in more moist and temperate climates.

Antiquity of Horse-shoeing.

This is not the place to give a history of horse-shoeing, but it is well to mention that there is no evidence in Biblical history of horses being shod. Not till well on in the Roman era is there evidence that horse-shoes had been used. The practice seems to have originated in Central Europe, and the Romans undoubtedly improved on it. There is some reason to believe that it was practised in Britain before the Roman invasion, and there is evidence that it was comparatively common in Scotland before the Norman conquest of England.

Ancient Horse-shoe.

A shoe found near Strathmiglo, in Fife, and given to me by Mr Arthur, one of our students, an illustration of which is given (fig. 131), has puzzled our local antiquarians. The shoe is still attached to a hoof, and has evidently been worn a very much longer time than we could approve. The frog has quite disappeared; being of softer horn than the rest it has been the first to undergo decay, but the wall and sole are still complete. Owing to the breadth of the web of the shoe the sole has been undisturbed, has not been shed, and is about an inch thick.

The shoe is also completely worn through at the toe, so that it seems to be about five-eighths of an inch shorter than it had been originally. It had therefore probably been worn about six months before the animal's death, and possibly the animal may have been lame and walking more on the toe than if quite sound. Its greatest width is 4 inches, its greatest length fully 5 inches, but before being worn it must have been 5½ inches

long. It is barely a quarter of an inch thick opposite the nails, and is thinner towards the heels. A narrow raised head passes round the outer border, and at the heels had been turned in over the sole like a lapel on each side. The branches have been welded together at the heels, and the weld is not so complete but that the overlapping of one branch is still quite distinct. And, as if the forger had been doubtful of his weld, what looks like a rivet has united the branches in the centre (fig. 132). This apparent rivet has had a big head on the ground surface, still quite distinct, while no head is visible on the solar surface, so that I am inclined

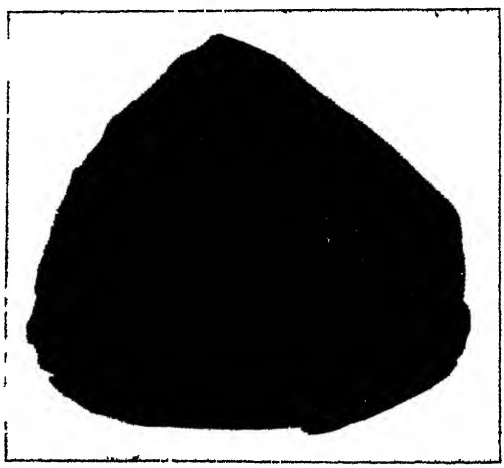


Fig. 131.—*Fife shoe.*

to think that it has been intended as a stop or catch to prevent slipping.

The nails, with big heads about five-eighths of an inch square, four on each side, are placed close together, the heads touching, while the points approximate so that the four points on each side are in a cluster. None of the points have been broken off, but have been clenched by being twisted up like ram's horns, and flattened on the wall of the hoof. The heads of the first two nails, one on each side, have been completely worn away with the wear of the toe of the shoe, but the heads of the other six are still complete. There is no fullering. The shoe altogether is somewhat pear-shaped, and the opening in the centre, very similar, is 2¼ inches long by 1 inch broad at its broadest part. Lastly, it is very much rolled on the ground surface. When resting on a level surface, instead of being level, the heads of the nails only touch the supporting surface, while the

extremity at the heel is raised about an inch. The front part is worn away, but the spring at the toe has apparently been three-quarters of an inch. It has therefore been a veritable rocking shoe.

Now, how did this shoe come to be in Fife? This is difficult to answer. The probability is that it was not made in Fife. It bears a very strong resemblance to Syrian and Arabian shoes, not only in its shape and manufacture, but in the way the points of the nails are clenched. Then, if it came from the East, two hypotheses are possible,—either that it was introduced on the foot of some Arabian or Eastern horse, imported by, or presented

Fig. 132.—*Fife shoe.*

to, some of our ancient Scottish kings, who used often to reside in the "Kingdom," or that it had already been preserved as a *curio* or museum specimen and been lost, or thrown out, as not worth keeping.

Since writing the above, through the kindness of Mr Cunningham, V.S., Slateford, I have been shown a shoe with hoof attached he has in his possession, which was brought from Algiers by a friend, and is represented as a common shoe of the country. It is much smaller than the shoe illustrated here, flatter on the ground surface, although the curve upwards at the heels is fully as pronounced. It has no bead around its outer border, no rivet through the weld at the heels, and the points of the nails—six in number—are broken off and the nails clenched very much as

they are in this country. As in the other shoe there is no fullering, but the heads of the nails are not square but T-shaped or oblong, their long axis being parallel to the branch of the shoe. It does not seem to be much worn away at the toe, yet it is comparatively straight across. But the hoof seems worn, and has a very truncated or "stumped up" appearance, as if greatly worn before the shoe was applied.

Handling of the Colt's Feet.

Under ordinary conditions, or apart from accidents, a colt is seldom shod until he has received some preliminary training to the work for which he is intended. There is often a great deal of harm done in taking a raw unhandled colt straight away to the forge to be shod. If he has not been a little handled he has no confidence in his groom or attendant, the place looks strange and forbidding, everything is new to him, and the poor brute does not know whether he is to be despatched at once or skinned alive first. So all colts ought to have their legs and feet handled in their own stable, by their usual attendant, before shoeing is contemplated.

The single attendant can usually manage to lift and manipulate the fore feet and legs unaided, and frequently the hind ones also; and the colt should be accustomed to having them tapped with a hammer. But for the hind ones an assistant is often required, and it should be done in his own stable, in his own stall if possible. Even if the colt has been handled about the legs, the assistant ought to handle him gently over the quarters and down the thighs.

Supposing that it is proposed to lift the left or near hind leg, after a little handling the assistant allows his left hand to rest against the angle of the hips, strokes down the thigh and outside of the hock with the right one until the hand reaches just above the fetlock. The back of the leg should then be quietly but firmly grasped with the right hand, or where there is plenty of hair the fetlock, while the left presses the quarters towards the right, and the groom draws the head a little towards the near side, the colt tends to ease his leg, the right hand draws it rapidly but quietly outwards and forwards, flexing it at the hock. At the moment the left hand is released, and coming to the assistance of the right, should flex the fetlock. The toe of the hoof is caught from above and behind by the right hand, the left leg above the knee is rapidly applied to the front of the fetlock, the leg carried backwards, and the left hand grasps firmly the joint of the hock.

The leg is absolutely secured. If the colt has been well forward into the opposite corner of the stall so that he cannot jump

forward, and the precaution has been taken to remove all litter that might trammel the feet, a strong, active, resolute man will hold the limb of the best colt in Christendom—at least all but the most untameable mustangs will be easily mastered. A similar process has to be gone through with the off-leg, and the thing repeated sufficiently often to enable the colt to understand that it does not harm him. Some, who are very expert at it, prefer to lift the hind-feet with the hand nearest the colt, that is to say, the colt's left hind-foot with the left hand, without a hand resting on the quarter, and as soon as the foot is lifted off the ground the hoof is at once caught by the right hand, the lower part of the left thigh brought against the fetlock, and the foot is rapidly secured.

In draught colts, and those with a good deal of hair about the legs, the *fetlock* is often serviceable in lifting the limb. The hand has more power there than farther up the leg, and is more easily slipped on to the toe of the hoof from that position.

Besides being handled in this way, colts ought when possible to be taken to the forge in pairs to be shod; or if there is only one, he should be taken with an animal that he knows, and only after shoes have been prepared for him, and the forge is clear, so that he can at once have the undivided attention of the shoeing-smith. Many a colt that stands quietly enough at first becomes restless if long detained.

Examination of the Feet.

Before selecting shoes, an examination should be made of the feet and of the animal, to ascertain what size and style of shoes are required. In the more recent scientific works on horse-shoeing directions are given to have the animal walked and trotted to and from the observer, so that he may be guided by the gait; but, unless in the more obvious peculiarities, the ordinary artisan is as likely to be led astray as not by attempting too much: and as a rule he should be guided by examining the animal standing on a level surface and by the wear of the hoofs or shoes. He should be looked at from the front, to see whether the obliquity of the sides of both fore and hind hoofs are natural, and whether the ground surface of the hoof is at right angles, or bears a proper relation to the long axis of the limb—the outside should always be slightly more oblique than the inside,—and looked at from the side to observe the obliquity of the front of the hoofs, the depth of the heels, and whether the obliquity is in line with, or bears a proper relation to, that of the pastern. Although it is generally held that the slope of the hoof should be in line with that of the pastern, still

in a well-shaped foot and leg the line ought always to be bent forwards at the coronet.

In a horse with moderately oblique pasterns, unless the slope of the hoof is slightly less than that of the pastern, the hoof will be too flat. The bending of the line forwards at the coronet is shown more distinctly when the horse is made to stand on one foot, so that all the weight of the fore-end of the body is thrown on one leg. A flat foot is always a weak one. A foot may easily be too upright, but seldom with any detriment to the hoof itself; the danger is to the coronet and pastern. But a properly sloped hoof is as much stronger than a flat one as an acute-angled roof is stronger than one formed at a right angle.

But the animal to be shod may be already wearing shoes, and the wear of these will serve as a guide to the shoeing-smith. If a shoe is too much worn at one side, the chances are that the worn branch of the shoe has been too directly under the axis of the limb, too much under the foot, and this must be looked to in fitting the new shoe, and so on. Excessive wear at the toe may be due to the pulling work the animal is employed at, but is more frequently due to the effects of hard work. Shoes most worn at the heels, apart from disease, are seldom met with but in fast trotters. Horses that take a long reaching stride bring their heels to the ground quite distinctly first.

Of course lameness or disease may account for all forms of unequal wear.

Removal of the Shoes.

But the old shoes must be removed, and this should not be done roughly. Every clinch should be raised or cut, the pincers used to grasp first the inner branch of the shoe, or rather encompass it, the jaws of the pincers meeting as far as possible between it and the hoof back towards the heel. The handles of the pincers are then moved in a direction parallel to the branch and used as a lever to force apart the shoe and hoof. If at all firm, a number of the nails should then be pulled out by the pincers singly, and the other branch of the shoe released in a similar manner.

Preparation of the Foot.

There are comparatively few horses with moderately good hoofs that do not require to have the hoof shortened at each shoeing. Shoes prevent the natural wear of the hoofs, and paring or dressing of them sufficiently to compensate for the want of that natural wear is required. Some horses wear their hoofs sufficiently with shoes on, but these are generally fast

horses with very free action, doing from twenty to thirty miles a-day at a rapid pace.

A great deal of nonsense has been written about making the shoe to fit the foot and not the foot the shoe. As a matter of fact, there are very few feet that do not require to be altered, modified, and guided in regard to their wear and direction. The main tendency of a shod hoof is to grow too long. The shoe is carried forward by the growth of the hoof, and does not bear the same relation to the axis of the limb that it did when applied. The obliquity of the front of the hoof becomes too great (fig. 133). In order to remedy this, as a general rule the wall requires to be more shortened round the toe than elsewhere (fig. 134). So much has been written in the recent past about the evils of the drawing-knife and the mutilation of the

Fig. 133.—*Hoof grown too long at the toe.*

Fig. 134.—*Overgrown hoof prepared for the shoe.*

Fig. 133. The shoe has been left on the foot too long, and the hoof is too much grown, especially at the toe

hoof, that protection of it has often been carried to the other extreme; and hoofs have often been seen at shoeing competitions at our national shows untouched, or only showing an appearance of having been scraped, which really required some dressing to remove the overgrown wall and prepare a proper level bed for the new shoe.

After dirt and loose horn have been removed the rasp is the proper instrument to run round the anterior edge of the wall to shorten it. But it is very seldom that the drawing-knife is not required. It has often been stated that the sole should not be touched with the knife. This would be correct in the immense majority of cases were the hoofs in their natural condition, but they are not. A rim of iron has been attached to the lower border of the wall, and this rim has prevented the natural wear and exfoliation of the sole from taking place. The shoer ought to be the best judge. The sole ought always to be concave. It

ought always, in a natural hoof, to be above the level of the lower border of the wall.

Little else is required. The bars should never be cut away: scooped out is a more accurate term for the way they are often removed And the buttresses between the bulbs of the frog and the heels should be left intact. The frog seldom requires anything but the removal of loose ragged horn. And last, the heels and whole under border of the wall should be made as level as possible by the rasp. Before leaving it the foot should be allowed to rest on a level surface, and a front and lateral view of it taken to see whether it seems to bear a proper relation to the limb.

Refitting old Shoes.

This is perhaps the better place to refer to a custom, more common amongst the agricultural than the commercial classes, of having half-worn shoes removed and reapplied. They are often more than two-thirds worn. Throughout Scotland the practice is to have calkins and toe-pieces on the shoes of horses used for agricultural purposes. The farmer is to be excused if, when slack time in the work of the farm is approaching, he give instructions that his horses' shoes are to be removed and put on again. But it is often a "penny wise and pound foolish" method. The horse-shoer does not put himself to the same trouble with old shoes that he does with new ones, and the shoes are reapplied unsatisfactorily. Very often the shoes are a little unequally worn—one branch and calkin more worn than the other, often the outside one. The heels of the shoe are heated in the forge and the calkins turned up afresh without the branches being drawn one bit. The consequence is that the shoe, which ought to have been the proper length before, is now as much shorter as the calkins are higher; while if one calkin was more worn than the other it is generally due to its being more under the centre of gravity, more under the axis of the limb, and that branch of the shoe is now the shortest, throwing it still more under the centre of gravity than it was before.

In addition to this a new toe-piece is often welded on to the top of the old worn one, and the shoe reapplied without due care being taken to observe whether the bearing surface of the hoof bears that relation to the axis of the limb that it ought to do. Depend upon it that if the shoe is unequally worn, the hoof will also be unequally worn, and will require to be dressed accordingly.

The shoes, as described, are put on well enough nailed as a rule, but a little more horn is removed at the toes to let the shoes a little farther back, as they are rather short at the heels.

What is the result? The horse is raised farther from the ground, while he has a more confined base to stand on. His footing is precarious and insecure. The base at the ground is too narrow, too confined, for the height of the column it has to support. This does not harm the hoofs so much as might be expected: the harm is more frequently to the limbs. Were the horse used on soft land the risk would be less, as the foot tends to find its own level; but it often happens, when work on land is not much wanted, that the animal is used—it need not be at hard work—on the road.

Many a horse has shown his first lameness the day after having his old shoes removed. It may be spavin, it may be side-bones, it may be sprain; but the evil is a notorious one, and well known to every veterinary surgeon in our agricultural districts. Let the old shoes be utilised by all means if they are worth removing, but do not let them be shortened. If one calkin is excessively worn remove the cause if possible, draw that branch of the shoe between the calkin and the last nail-hole, weld on a calkin or beat down the opposite calkin, dressing the hoof to correspond. But it is a very extreme case that will justify the welding of a toe-piece on to the top of another, and even then it ought to be low and thoroughly beaten down.

Nothing to equal Iron Shoes.

Notwithstanding the importance of horse-shoeing, the length of time that has elapsed since it was introduced, and the many attempts that have been made to find a substitute for iron in making shoes, nothing has yet been found to equal, or even to approach, good malleable iron in the manufacture of horse-shoes.

Specially prepared leather, vulcanite, and compressed paper have been tried, as well as steel, and various alloys of aluminium, but good wrought-iron is still an easy first. Many attempts have also been made to find some satisfactory means of fastening the shoes to the feet other than by the use of nails, but all have been practically failures. The immensely improved machine-made nails, ready to be driven, that are so plentiful in the markets now, leave little to be desired, and are not the unmixed evil that nails used to be considered thirty or forty years ago.

Selecting Shoes.

In choosing a shoe for a cart-bred colt, the weight and build of the colt should be taken into account. But in any case the shoe should not be too heavy at first. It ought to have sufficient iron to wear at least four weeks, and that is easily managed

before an animal is trained to stand steady hard work. No shoe ought to remain on more than six weeks without being removed, and very seldom so long as that. As a rule, the flatter the foot, the more slope there is on the hoof, the broader is the bar required to make the shoe. A foot that is comparatively upright is usually pretty concave in the sole, and does not require much cover of shoe, much protection of the sole. A colt, therefore, should be shod with lighter iron than when he is more matured and into regular hard work. And this holds good even if the hoofs have attained their full size. He should also be shod flat. It is a sufficient change for a colt to be shod at all without sticking him on to stilts at once.

Machine-made shoes, cheap and fairly good, have been a considerable time in the market, but it is taken for granted that hand-made shoes are to be used.

The Seated Shoe.

Without going into all the details in connection with the making of a shoe, it may be stated here that the "seated" shoe is the shoe that has best and longest stood the test of experience.

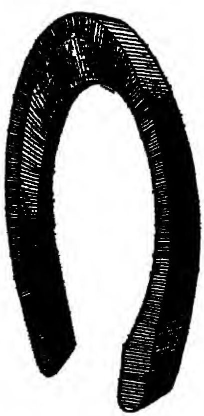


Fig. 135.—*Seated fore-shoe for harness horse—fullered.*

A seated shoe, then, is a shoe that, while perfectly flat, horizontal, on its bearing surface, is bevelled or dished out round its inner border until towards the heels (fig. 135). The slope or bevel should extend from within the nail-holes, but be kept quite clear of them. The distance it is carried backward should depend on the form of the shoe. If a short flat shoe terminating at the heels of the hoof, it may be carried to about an inch from the ends of the branches; but if a shoe with high calkins, the bevelling may profitably be stopped at least a couple of inches from the end of the branch, the reason being that a considerably longer shoe is required in the latter case.

A shoe should generally be made broader round the toe than towards the heels; but it depends to some extent on the shape of the hoof. A flat hoof requires a broader shoe, a shoe with more cover for the sole than a well-formed hoof, while the breadth required at the heels may not be any greater.

Very different opinions are held regarding the form or direction of the outer border of the shoe. Dealers' horses, and horses

intended for exhibition at shows, are often shod with shoes the outer border of which is much wider at the ground surface than at the bearing surface. In fact, the slope of the hoof is continued on the shoe, and often more slope than the hoof has towards the quarters. This gives a false appearance of size to a small foot, but should deceive no one except the extremely uninitiated.

This form of shoe is an unmixed evil. It requires a bigger, heavier shoe, it is much more difficult to lift on soft ground, it is more apt to strike or interfere with the opposite leg, it is more likely to be trod on and pulled off, and it is more difficult to make, to "fuller" in the requisite position so that the nail-holes may be punched of the proper coarseness and inclination to suit the hoof. The outer border should rather be within the perpendicular, and rounded off below, especially along the inner

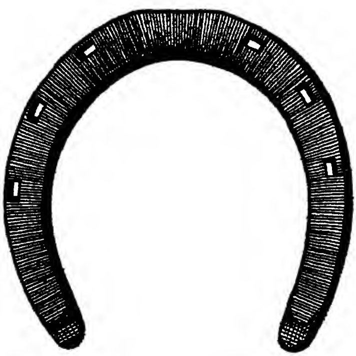


Fig. 136 —*Right fore-shoe, ground surface, made of narrow iron—stamped.*

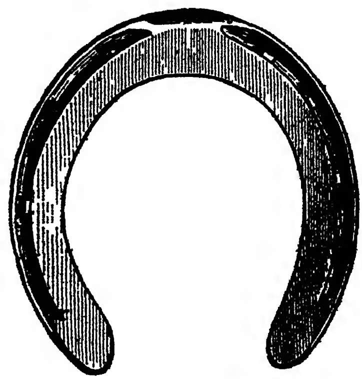


Fig. 137.—*Right fore-shoe, ground surface—fullered.*

branch, where it is more likely to interfere with the opposite leg. Shoes made in this way are lighter and much less likely to become loose or be pulled off.

Nail-holes.

The punching of the nail-holes is of the first importance in the making of a shoe. This may be done by "stamping" or by "fullering." By "stamping," the holes are punched at a given distance from the edge so as to leave tapering holes fitted to receive the nail-heads (fig. 136). This method is very little used in Scotland. By "fullering" is meant the making of a groove on the ground surface of the shoe, at such a distance from the outer border of the shoe that the nail-holes can be punched in it, and the groove receive the nail-heads (fig. 137).

In small hoofs and thin hoofs the "fullering" must be near the outer edge of the shoe, and is then said to be fine. In large and strong hoofs it should be much farther from the edge, and is then termed coarse. Iron may be obtained in bars with a groove or "fullering" ready made in the bar, and in that case the groove runs round the shoe from heel to heel. This is very little used in Scotland, and except that it saves labour is of very little advantage. It is with difficulty that the nail-holes can be punched either finer or coarser, and the shoe wears more rapidly at the toe. In "fullering" a shoe the groove should be carried at least two-thirds through the depth of the iron, and when there is no groove in the bar, should begin on each side of the toe, and need not be carried within an inch and a half of the end of the branch, even in a flat, close-fitting shoe. In some districts it is the custom to carry the "fullering" all round the toe. While this possibly improves the appearance of the newly finished shoe, and tends more to prevent slipping, it undoubtedly weakens the shoe at the part where it should be strongest—right at the toe.

The form of the groove is of great importance in punching the nail-holes (fig. 138). The "fullering" should not be too fine,

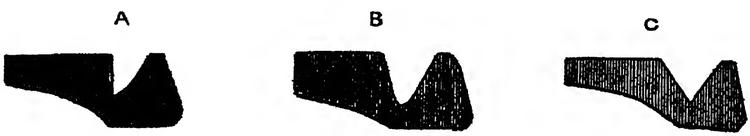


Fig. 138.—*Cross section of fullered shoes.*

A Fullering too narrow, inner wall too upright.
B Fullering fairly good, inner wall quite enough slope.
C Fullering bad, too wide and too shallow.

should not be done with too narrow a tool, and while the inner edge of the groove should not be at right angles to the ground surface of the shoe, far less sloping inwards towards the bottom of the groove, still it should have less of a bevel on it than the outside.

For cart-bred horses the shoes should not have fewer than seven nail-holes, and for heavy lorry horses wearing calkins and toe-pieces, nine or ten nail-holes are sometimes beneficial. Although the nail-holes are present in the shoe there is no reason why each should be filled with a nail, and when a hoof is much broken several nail-holes may with advantage be left empty. In light-bred horses wearing much lighter shoes, five to seven nail-holes are generally sufficient if well placed and good holds are secured with the nails.

The nail-holes should not be all crowded together towards

the toe, but well spread in the anterior two-thirds of the shoe, and in a well-formed hoof may be a little farther back on the outside than the inside. In punching the nail-holes those at the toe should be directed slightly inwards, and the flatter the hoof the greater the necessity for this; those farther back a little less so, and the posterior holes should be punched at right angles to the ground surface of the shoe.

Clips.

Clips are small leaf-like projections drawn upwards on the anvil from the outer border of the shoe. Without being thick and coarse they should be sufficiently strong at their base to enable them to give considerable support to the hoof, thinning off at their free edge so that they can be flattened on the outside of the wall. They are often made too high and pointed, especially at shoeing competitions, where they have frequently been seen over an inch and a half high, and tapering to a sharp point. This is decidedly dangerous, and many a horse has been killed through a loose shoe becoming shifted and the sharp clip forced into the sensitive tissues. They should always be more or less circular on their upper edge, not drawn to a point, and no higher than is necessary for support. Under ordinary conditions, and with good natural hoofs, a clip is always placed at the toe.

Side clips or quarter clips are often useful. In horses that incline to wear the outside of the shoe more than the inside, the shoe is apt to become displaced inwards and a quarter clip is very useful. It need not be so high nor yet so strong as a toe-clip—seldom higher than the thickness of the shoe; and when the wall at the quarter is thin and weak, it is an advantage to have the base of the clip a little fuller than the outer border of the shoe, so that little horn requires to be removed for the reception of the clip. They ought to be a little stronger—larger—on the hind shoes than on the fore.

Fitting the Shoe.

Shoes may be fitted either hot or cold, and cold-fitting has still its advocates. But cold-fitting is now seldom used except on military horses when on active service. There is much more difficulty in obtaining an accurate fit with a cold shoe than with a hot one. Machine-made shoes are more easily fitted cold than hand-made ones, as they are more uniform in shape and have a more accurately level, horizontal, bearing surface. In cold-fitting it is necessary to rub the bearing surface of the shoe with chalk for a dark hoof, and some dark material for a

white one, in order to obtain complete and close coaptation between the shoe and the hoof. When the shoe is applied the colouring matter remains on the hoof, showing where it requires to be further rasped down to obtain a close-fitting surface: and after all an accurate fit is difficult to manage.

The evils of hot-fitting have been greatly exaggerated. Horn is a bad conductor of heat, and no harm need result if the hot shoe is intelligently applied to obtain a close accurate bearing surface. Before the shoe is applied at all it should be seen that it is perfectly level on its bearing surface all round to where the seating begins about one-sixteenth of an inch inside the nail-holes; that towards the heels where the seating does not extend it should be perfectly level and horizontal; and that when the shoe is held in front of the eye with the branches in line they should be perfectly straight and uniform. The shoe may then be heated all round to a dull red heat and firmly applied to the hoof for ten or fifteen seconds. In thin and diseased hoofs it is quite easy to do harm by applying the hot shoe too long at a time, and a painful condition known as "burnt sole" is produced. But this is only due to gross carelessness, and in good natural hoofs there is no risk with ordinary care unless the sole has been pared too thin round the toe, too much horn removed to receive the clip, or the shoe applied too long. Repeated applications of the hot shoe do no harm if an interval is spent in levelling the hoof between them; the charring of the horn renders it more impervious to moisture, and a much closer and more accurate fit is obtained.

In a natural well-formed foot the shoe should be made to fit the hoof. The outer border of the shoe should be exactly under the outer edge of the wall at the sides of the hoof. Towards the toe, a very little of the wall may be allowed to project beyond the shoe, to be rasped off after the shoe is affixed. This only serves to a slight extent to compensate for the horn that would be worn or broken off during the first hour that the horse was running naturally unshod. From the quarters back to the heels the shoe should become gradually fuller than the hoof, until at the heels it should project from one-eighth to one-fourth of an inch beyond the lower border of the wall, depending on the size and form of foot. As a rule the outside branch should be slightly fuller than the inside; and the inside branch of a hind-shoe should practically follow the line of the wall.

The shoe being fitted, the branches should be cut to the requisite length. They should extend nearly half an inch farther back than the heel of the hoof—depending greatly on the style or pattern of shoe used—should be cut off with a short slope or bevel from the ground surface upwards, but should be well rounded off at the upper border.

Finishing the Shoe.

The shoe, being now fitted, should be put in the vice and finished off with an old rasp or a file. This certainly makes the shoe look much smarter and neater, although the more accurate the workmanship the less filing is required.

Fitting the Clip.

It is well to observe that the semicircular gap usually made with the drawing-knife at the toe to receive the clip is very unsatisfactory. The clip is there for support, and is practically straight across its base, consequently it does not fit the curve left where the horn has been removed from the hoof, but at its base only touches the horn at the extremities of the curve, leaving a hollow in the centre. It is better, therefore, to remove the horn required with the rasp, so that the clip may come in contact with the horn throughout its whole extent.

Nailing on the Shoe.

Immediately the shoe is fitted it should be cooled and again applied to the hoof, and carefully examined to see that it fits properly and accurately. When firmly applied to the hoof with the clip in its proper place, it should lie solid, have little tendency to shift, and no tendency to rock whatever part of the shoe may be pressed on. The nail-holes should be exactly opposite the white line, and it ought to be seen that they have the proper direction. Machine-made nails are almost invariably used now, and few really bad nails are in the market. They should be made of the very best iron, be solid, bright, soft, and ductile, yet stiff enough to stand being driven without bending under the hammer. There should not be a distinct neck between the head and shank, as this is the point at which the nail is most likely to break. They are generally about double the width of their thickness, and the heads should be sufficiently large to project slightly beyond the level of the shoe. They are made in sizes to suit all feet, and should never be used larger than is absolutely necessary, as the smaller the nail the less injury it does to the hoof, and the fewer the nail-holes required the better.

Hand-made nails, made of the best Swedish iron, are still unequalled for fastening the shoes of heavy horses wearing calkins and toe-pieces and doing extra heavy work. The nails should be driven straight through the wall at an angle, and not too high. That this may be done, as the point of the nail is bevelled outwards to bring the nail out on the surface of the

wall, the centre or belly of the nail should be bent a little away from the hoof, so that the nail in being driven may take an almost straight course and not a curved one.

The height at which the nails should come out on the surface of the wall depends mainly on the weight of the shoe and size of the hoof. But a nail driven in the white line, traversing the whole thickness of the wall, and coming out at a moderate height, is much more satisfactory than one driven outside the white line although coming out very high in the wall. The latter splits the fibre of the hoof more, gains no stronger a grip, and the track of the nail is longer in wearing out. It is sometimes beneficial to use different-sized nails in the same hoof. In a hoof with thin quarters smaller nails may be used posteriorly than can safely be used towards the toe.

The nail being driven with fairly light strokes until the point makes its appearance, is then more rapidly driven, and the point at once twisted off with the claws of the hammer. As soon as the nails are all in position, they should be gone over in succession with the hammer and firmly driven home. The jaws of the pincers are then held under the broken points of the nails while the heads are again hammered, in order to turn the points more acutely round. As the points are generally left too long, the position of the foot is now reversed, and they should be reduced to the required length by the file surface of the rasp. The edge of the rasp should then be drawn across below the point of each nail to remove the ragged sharp angle of horn and give a firmer bearing to the clench. The pincers is now held under the head of each nail in turn while the clench is turned down with a few light taps of the hammer. The operation is finished by hammering the edges of the clip as flush with the surface of the wall as possible, but not in a manner to grip the wall, rasping off any projecting horn round the anterior border of the wall, smoothing down the clenches, care being taken not to file them off, and running the edge of the rasp round the lower border of the wall between the wall and the shoe, to take off the sharp edge of horn and prevent splitting of the fibres. No rasping should ever be allowed, on a healthy hoof, above the clenches. When the clenches are about a uniform height and distance apart—the posterior perhaps a little lower than the anterior—it adds greatly to the appearance of finish about the work. The last shoe finished, the hoofs should be dressed with some greasy application to make the cut horn fibres more impervious to moisture, and prevent evaporation.

Hind-Shoes.

Except in the case of abnormal or diseased feet there is no necessity for seating hind-shoes. The sole of the hind-foot is more concave, the hoof is narrower, more oval, more pointed towards the toe than a fore one, and there is much less necessity for cover or protection to the sole. The shoe should therefore be made of slightly thicker but narrower iron, about the same width all round, and the bearing and ground surfaces parallel and horizontal. Care should be taken that the inside branch does not project from under the hoof, and that if calkins are present the inner one should slope rather under the foot and be well rounded off below. 'Bus, van, and light lorry horses are often shod with low calkins on their hind-shoes, although without calkins or toe-pieces elsewhere.

Calkins and Toe-pieces.

In Scotland and the North of England calkins and toe-pieces are much more common than farther south. They certainly give a better grip on our granite-paved streets than flat shoes. But in country districts it is often an advantage to the horse to be shod flat. By raising the frog clear off the ground calkins remove that support from the sensitive frog and posterior part of the foot to which it is entitled. From want of the natural stimulus—pressure—the frog is apt to atrophy—shrink—and the condition becomes worse. They also tend to produce side-bones. By raising the foot they make a proportionately smaller base for the height of the column it has to support, and increase the leverage against which the muscles and tendons have to act. They are apt to become fixed on paving-stones and in rails, and may cause severe sprains, spring the hoof at the coronet, or throw the horse down, rupturing ligaments, dislocating joints, or fracturing some of the bones of the leg.

Calkins.—When calkins are used the shoe is made in the way described for a flat shoe, but each branch is left about a couple of inches longer. They should never be made high, not more than the thickness of the shoe from its under surface. When the end of the branch is turned down, over the end of the anvil, to form the calkin, it should be made considerably longer than is required, and while quite hot should be hammered down as square as possible to increase the thickness, solidity, and wear (fig. 139). The calkins should both be of one height in a normal foot, and while the outside calkin may project a little farther outwards than the outer edge of the branch it springs from, the inner should be kept well under the

branch, and in horses that go close may require to be rounded off below, or even sloped a little under the foot.

Toe-pieces.—In a natural healthy foot calkins, unless very low, should never be used without toe-pieces. Toe-pieces are usually made from a square or rectangular rod of iron, which is welded on at a white heat across the toe of the shoe. They should never be set on the point of the toe, but kept from a quarter to half an inch under it at its centre, and if rectangular laid on the flat, not set on edge. When high and set on the very point of the shoe they increase the leverage against which the horse has to exert his strength, and throw a much greater strain on the tendons. So the toe-piece, generally from three to four inches long, according to the size of the foot, should be kept well under the shoe to give the foot a better grip of it, should be laid on the flat, not set on edge, and the anterior angles of the ends should be rounded off and not allowed to project beyond the outer border of the shoe. Calkins and toe-piece should be of the same height, but in horses doing heavy draught work, especially if mostly up-hill, the calkins might with advantage be a little higher than the toe-piece. This is, however, a disadvantage if the horse has to take a heavy load down-hill, unless in a four-wheeled machine when a brake can be applied.

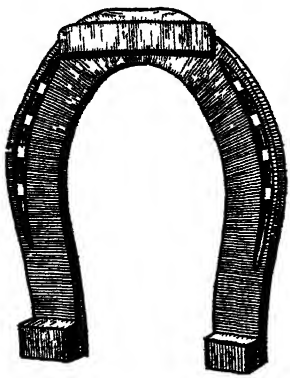


Fig. 139.—*Right fore-shoe with calkins and toe-piece.*

These shoes are more difficult to keep in position, eight or nine nails may be required, and for the hind-shoes of horses doing severe heavy work hand-made nails are to be preferred, an outside quarter-clip is generally useful, and the clips should be made a little stronger than for plain shoes. Shoes with calkins should extend at least an inch farther back than where the horn at the heels comes in contact with them, and the higher the calkins the longer ought to be the shoe.

Roadster and Carriage Horses.

Shoes for roadster horses ought to be made of much lighter iron, and from a bar of iron narrower in proportion to its thickness. Light roadsters and saddle-horses are usually shod considerably lighter than carriage-horses. Well shaped, fairly upright hoofs, if not very large, and distinctly concave in the

soles, are often shod with the make of the shoe reversed. It is comparatively narrow in the web, not much broader at the toe than towards the heels, perfectly level—horizontal—on its bearing surface, but dished—concaved—rapidly away on its ground surface from immediately inside the "fullering" and all round until close to the heel (fig. 140). The shoe should accurately follow the contour of the lower border of the wall as described for heavy horses, but greater care should be taken that the outer border of the inside branch should be under rather than beyond the wall, although it may project a little toward the heel, and be well rounded off below.

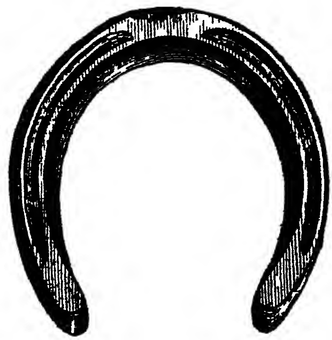


Fig. 140.—*Concave right fore-shoe—ground surface.*

When the shoe is being fitted the branches should be cut the required length, rounded at the ends, and bevelled from the ground surface upwards. They should not extend beyond the heels of the hoof more than from one-eighth to three-eighths of an inch, and should be well rounded off on their upper border.

In some cases low calkins are advisable, but toe-pieces should never be used in the fore-feet of trotting horses. Calkins may be made very low, and still be of service in preventing slipping by thinning the branch of the shoe gradually from about an inch in front of the calkin. It necessarily weakens the shoe at this point, but it does not get any weaker with wear, as this part scarcely touches the ground.

Hind-shoes are often made with low calkins, and unless the animal inclines to brush, may be made on the same principle as has been described for heavy horses; but as a rule more care is required in fitting the shoe. The inner branch, made a little narrower than the outer, may be bevelled slightly under the hoof, and instead of an ordinary calkin a narrow or wedge-shaped heel may be knocked up, sloped inwards, and well rounded off below.

But many horses, more especially riding-horses, require to be shod with a feather-edge inside. The inner branch is made narrow and considerably bevelled away under the hoof, while about 1½ inch at the end of the branch is made as deep as the opposite calkin, so that the horse may have a level tread. In some cases it may be necessary to bring the "fullering" round the toe, to nail round the toe, but no further than the position of the inside toe-nail, and to keep the outer border of the inner

branch slightly under the hoof until near the heel (fig. 141). The edge of the wall of the hoof should not be all rasped away flush with the shoe, but should be carefully rounded off and made perfectly smooth. An outside quarter-clip is also frequently useful.

But with strong carriage-horses, and with horses inclined to be a little flat in their feet, the seated shoe should be used. It should be broader in the web, have considerably more cover round the toe than towards the heels, especially than towards the inner heel, and be made quite flat (fig. 142). Hind-shoes are frequently used with calkins and toe-pieces, more frequently

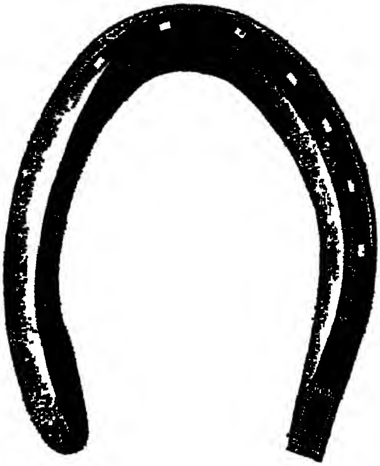


Fig. 141.—*Concave feather-edged hind-shoe, useful in preventing cutting.*

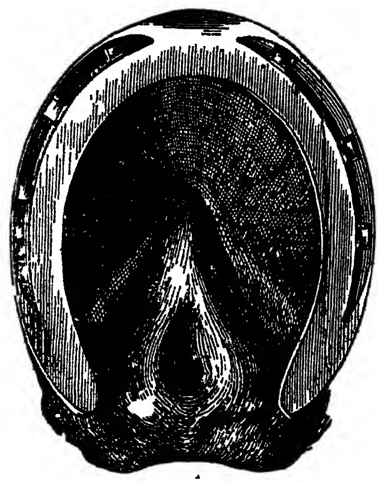


Fig. 142.—*Left fore-shoe on foot, fullered and seated.*

with cab-horses than carriage-horses, and few van-horses are used without them. They should be low, and the toe-piece set well under the shoe so that the foot may get a good grip of it. They may at times be the least of two evils, but are undoubtedly an evil, and when possible should be avoided. Hind-shoes should be made longer in the branches than fore ones, carried farther back from the heels, and with calkins should always be longer than when flat. There is no foot following up to tread them off. The same height of calkin does not raise the heel so high when an inch behind it as when well under it.

Hunters.

There is no class of horses which require to be more carefully shod than hunters. This is owing to the varied nature of the

ground over which they have to travel, to the leaping, often at a disadvantage, so that they run a risk of injuring the fore-legs with the hind ones when landing in the jump, and to the soft, heavy, sucking ground they often have to cross.

For these reasons the fore-shoes require very careful, accurate fitting to the hoofs. They should be made of comparatively narrow iron, flat on their bearing surface, and rapidly dished away from the ground surface upwards close inside the "fullering." Hunting shoes should not be made too light. If thin as well as narrow they are apt to yield to the rough usage they get, spread at the heels, and injure the hoofs as well as the opposite legs. The bearing surface is level throughout, and should practically come in contact with the hoof all the width of the shoe. It should reach about one-eighth of an inch inside the white line, and be a little rounded on its inner bearing border. But nothing like a hollow space should be left between the shoe and sole, as with such a space it is found that shoes are apt to be pulled off when galloping on soft heavy land.

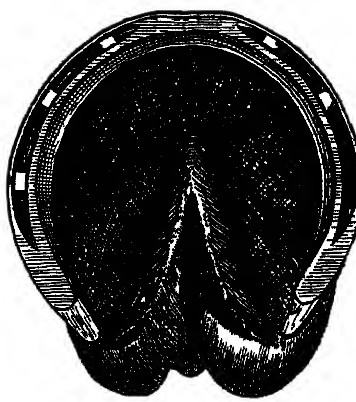


Fig. 143.—*Concave right fore-shoe—hunting.*

The shoe should be accurately fitted to the outline of the hoof, and while no part of the shoe is broad, should narrow considerably at the heels, and be no longer than the hoof (fig. 143). At the heels the end of each branch should be well sloped under, from the bearing surface downwards and forwards. The shoe then should lie close to the under surface of the hoof, and should follow accurately the contour of the wall, although slightly fuller towards the heels than at the toe and quarters. Fitted in this way it is much more easily lifted, and much less likely to be pulled off in soft heavy land.

If short and bevelled under at the heels they should not be too long at the toe. They should be kept fairly well back; and it is an advantage to the horse to have the toe turned slightly upwards, so that its ground surface is shaped nearly like a well-worn shoe.

For horses with biggish feet, inclined to be flat, these shoes may not be very satisfactory, and leather soles are sometimes an advantage; but horses with big flat feet are unsatisfactory hunters, and should be put to other work.

Hind-shoes should be fitted as accurately as the fore ones, but there is no necessity for having them so short at the heels. Instead of a toe-clip a small clip should be drawn up well to each side of the toe, the shoe not too pointed in front, and the hoof allowed to project over it (fig. 144). Shod in this way, with the toe of the shoe well rounded, there is much less risk of the fore-legs or heels being injured by the hind-feet. They are usually made with low calkins, or rather a calkin on the outer heel and the inner branch feathered, or a long narrow heel knocked up. The inner branch of the shoe should be kept well under the hoof, except towards the heel, and bevelled away towards the ground surface. And care should be taken that no rough clench or projecting edge is left that could injure the other leg.

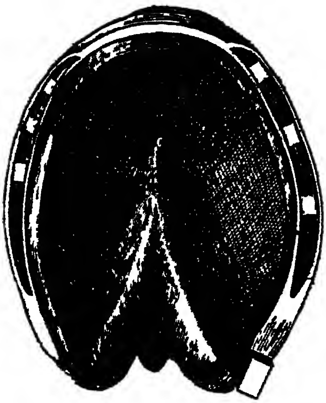


Fig. 144.—*Concave left hind shoe —hunting.*

The main points to be kept in mind in hunting-shoes are—they ought to be light and yet sufficiently strong to prevent their spreading or yielding under the rough work they have to stand; to be neatly and accurately fitted to the hoofs, the inner branches well rounded off or bevelled under, and the clenches well smoothed down; to be so close to the hoof on their bearing surface that no hollow space is left in which clay could lodge and aid in pulling off a shoe; to be short and somewhat rounded at the toes, the hind-shoes with small side clips and the hoof at the toe projecting a little over the shoe; and the branches of the fore-shoes cut short, no longer than the hoofs, and well bevelled downwards and forwards under the feet.

Over-reaching, Forging, and Clicking.

These terms are applied to that defect in a horse's action by which the hind-foot overtakes and strikes the fore one. It is mostly a fault of young horses, and tends to pass away with training and experience. But some horses continue to forge even after they are thoroughly accustomed to shoes and trained to their work. Others do it as a habit. They may go well enough until they happen to give a click, when, lo! it is continued, and the rider or driver has difficulty in stopping it. It may be confined to one foot.

It is sometimes a fault of conformation. Horses that stand high while short in the body, that stand with their fore and hind feet too near each other, that are upright in the scapula with humerus sloping too much backwards, are apt to over-reach. It most frequently occurs when the horse is tired and weary, when he is badly driven—allowed to lumber along as he likes without being driven well up to the bit.

Heavy roads are apt to induce it, and it is often due to careless shoeing. Too long shoes both fore and hind, the toes of both, the heels of the fore-shoes, are a great inducement to clicking. And while it is generally obnoxious to the rider or driver, some horses seem to enjoy the sound.

The prevention of forging does not all depend on the shoeing. If the horse is pulled together and well ridden or driven, it assists greatly even when he is tired. The fore-shoes should be made short, nearly like hunting-shoes. It is not always the heels of the fore-shoes that are struck, but often the inner border of the ground surface of the shoe at the toe. In that case the fore-shoe should be made rather narrow in the web and concave on the ground surface round the toe, well bevelled off from inside the "fullering." The toe of the fore-shoe should be well rounded, or a little "rolled" upwards as it is sometimes termed, the branches short at the heels and well bevelled under the foot. The hind-shoes should have small side clips, the toe pretty straight across and well rounded off, while the hoof at the toe should be left projecting over the shoe and not rasped off, only rounded to prevent its being broken.

Some writers confine the term "over-reach" to a particular form of this abnormality of action. They limit it to that form in which the hind-foot over-reaches the fore one to such an extent as that the toe of the hind-shoe comes in contact with the heels or the hollow of the heel of the fore-limb. In this way a wound is inflicted on the skin, and is said to be often done by the inner border of the ground surface of the hind-shoe catching the heel of the fore-foot as the foot is being drawn away. Sometimes a bruise, bruised wound, or comparatively clean cut is made. I need hardly say that this is never done at an ordinary pace, or at ordinary work.

The shoe already recommended for forging is the best for the prevention of this accident, with the additional precaution of concaving the ground surface round the toe, and having it well rounded off as in the fore-shoe.

Brushing, Buffing, Striking, Cutting, or Interfering.

These terms are applied to that vice of locomotion in which a horse strikes or touches one leg while the foot is on the ground

with the foot of the opposite leg while in motion. This is even more a fault of the young horse than over-reaching. Most young horses touch more or less when newly shod and while being trained. It may be due to weariness and fatigue, to want of training or condition, to bad horsemanship, to conformation, or to bad shoeing. The first three require no explanation. A tired, careless, or untrained horse does not keep his muscles under proper control, and the limbs come in contact, especially on a rough road or causeway. The same thing happens if he is not properly guided.

A horse that stands square and straight on his legs should not interfere. But a lady-toed animal is difficult to keep from cutting. That is an animal whose limbs approach each other down to the fetlocks, but from the fetlocks downwards they diverge. This is the usual conformation of lady-toed animals, although some may deserve the name in which the faulty conformation begins below the fetlocks. Bad shoeing, too heavy, too wide shoes, too full on the inside, rough, ragged, or raised clenches, shoes thicker on the outer branch or with a higher outer calkin than the inner, unsatisfactory preparation of the foot for the shoe by leaving the outer wall of the hoof too long, or rasping down the inner one too much, may all tend to cause interfering.

Most young horses brush behind, if they are being trained, when shod for the first time, and most of them give it up when trained and at home in their work, and accustomed to being shod. Like many other things, it is more easily started than got rid off. Once there is a wound there will be some swelling, and it requires very little repetition of the cause to increase the swelling and inflammatory action. The part becomes extremely sensitive, and the swelling brings it more into the way of the opposite foot, so that it is much more likely to be injured than it was at first. It is often necessary, therefore—if it is desired to avoid a permanently enlarged and blemished fetlock—to put the animal off work, or out of training to some extent, until the inflammation is reduced and the injury repaired. In the great majority of cases the injury is at the fetlock, but it may be at the coronet. When higher on the limb it receives another name.

An indication for the prevention of this defect in movement is obtained by observing that the unshod horse does not cut or brush. It is therefore, in the first place, due to the shoeing. The lighter and more uniform in thickness the shoe is all round, the less the level of the original bearing surface is disturbed; and the neater the inside branch of the shoe and inside clenches, the less likely is the animal to cut. A horse shod with calkins in the ordinary way will often stop cutting if shod flat. But

once the mischief is begun, once there is some enlargement and tenderness due to the cutting, it is more difficult to deal with. A careful examination of the limbs and hoofs should be made while the animal is standing level, and if the fetlocks are too close, the outside wall of each hoof might be lowered a little in the hope of throwing out the fetlocks to some extent. Then a feather-edged shoe (fig. 141, p. 272), or a shoe with a knocked-up heel on the inner branch, is used.

A real feather-edged shoe is nailed round the toe, and has an outside clip. The "fullering" is only carried along the outer branch and across the toe, while only one nail-hole, or at the most two pretty close together, are punched to the inside of the centre of the toe. The inner branch of the shoe is narrow, bevelled distinctly under the hoof, and is carried back from the toe-nail towards the heel much straighter than usual, so that the hoof projects considerably over it until near the heel (fig. 145). The branch should be of the same depth for about an inch and a half at the heel as the height of the outside calkin; and in some cases, for the purpose of throwing the fetlock out, it is an advantage to have it deeper than the outside calkin. This is most easily managed by hammering down the calkin.

Fig. 145.—*Cutting shoe, near hind, toe and side clips.*

Some horse-shoers, when only putting one nail in the inside toe, put a nail or two in towards the heel; but there is some difficulty in getting the necessary width of branch at the heel, unless the nails are let down in a short fuller at the outside of the branch, the depth being maintained inside that. In this case the shoe must be carefully chamfered down in the vice when hot, and the nail-heads usually require to be rasped or filed down after the shoe is driven. A great deal depends on the part of the foot that comes in contact with the limb, and this can be learned by putting some colouring matter on the fetlock or part struck, so that it is transferred to the foot that strikes it.

In the majority of cases it is towards the toe—seldom so far back as the quarter. Cutting with the calkin or towards the heel is generally confined to horses that injure the coronet while going at a walking pace. But it is easily seen that there is no use in trying to prevent cutting until sure of the part that

inflicts the injury. A knocked-up heel, well bevelled under the foot, is of more use in the heavy horse that cuts his coronets than in the trotting horse which injures his fetlocks.

Speedy Cutting.

The term "speedy cutting" is applied to a similar defect, in which a trotting horse strikes and injures the lower part of the knee by the opposite foot while at the trot. This injury is situated towards the inner, lower, and posterior aspect of the knee, and is generally inflicted by the shoe towards the toe of the foot. It is much more dangerous than brushing behind, or even cutting of the fore-fetlocks, as, when inflamed and painful when struck, it is very apt to bring a horse down. Any enlargement is also a greater blemish: it is more unsightly, and diminishes the value of the animal more than a similar enlargement at the fetlock.

It is foolish to use a good horse with an inflamed painful enlargement due to speedy cutting. He should be laid aside and treated until all pain, at least, is gone, or else he will not be very valuable long. Then the shoe should be thoroughly flat. No calkins or knocked-up heels should be allowed. Rasping down the outside wall of the hoof may assist a little, but is not so uniformly useful as in cutting at the fetlocks. The part of the shoe which offends should be ascertained, as already indicated, if not quite evident by the brightness of the shoe or the presence of blood on it. The inside branch should be straightened at the offending part (fig. 146); it should be kept narrower than the outer branch, and well bevelled in below—almost diagonally from its outer and upper border, while the wall of the hoof is allowed to project over it and carefully rounded off. It is often necessary to use an outer toe-clip, to nail round the toe, and avoid putting nails in the inner branch at all; or, if the cutting is done near the toe, a couple of small nails might be put in towards the inner quarter (fig. 147). It is no disadvantage, but generally the reverse, to have the outer branch of the shoe heavier than the inner, and as this cannot be done by increased thickness, it must be done by an increase in the width of the branch under the foot. This increase cannot be brought back to the heel, and the branch—the shoe altogether—should be kept short.

Apart from shoeing, leather boots are often used to protect the fetlocks; but in wet weather the strap which keeps the boot in position is apt to chafe the skin, owing to sand and dirt getting in between. A thick rubber ring is sometimes put on over the foot and allowed to rest above the fetlock, giving some protection. A patent pad is also made with a concave

surface to fit the hoof, and a thin part projecting nearly at right angles between the hoof and the shoe; the nails that attach the shoe are driven through it, and serve to keep it in position. The same pad is serviceable in preventing speedy cutting; but I know of no boot or application to the knee itself of much use.

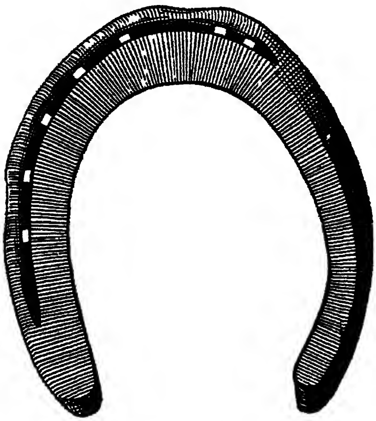


Fig. 146.—*Feather-edged right fore-shoe, toe and side clips.*

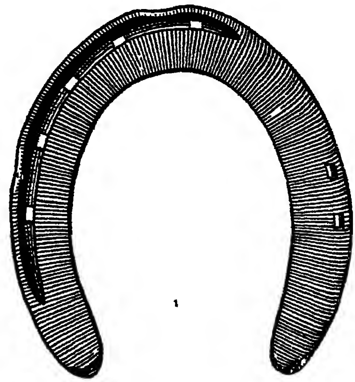


Fig. 147.—*Speedy-cutting right fore-shoe, toe and side clips.*

It can sometimes be prevented, however, by putting a leather gaiter on the limb of the offending foot, so that it embraces the fetlock joint, extending both above and below it. It acts as a restraint upon and limits the action, so that the foot is not lifted so high. The horse also inclines to carry the limb wider, away from the weight-bearing leg.

Care of the Hoofs.

Hoofs when shod are more liable to disease and deformity than when unshod, if not properly cared for. The practically non-elastic shoe hinders the natural movements of the hoof, and in this way retards the circulation and diminishes the growth of horn. It removes the hoof from contact with the ground and paved streets and while standing in the stable—especially in the case of the fore-feet,—tends to prevent that absorption of moisture which takes place when the unshod hoof is in contact with the damp ground, and which is so necessary for the maintenance of the desirable suppleness and toughness of the horn. Idleness, protracted standing in the stable, is very much against the growth and quality of the hoofs. They become dry and brittle, and are apt to contract; while, if standing in dirt, thrush and even worse evils may be induced. Therefore, whether

working or not, horses should have their shoes removed every four to six weeks, according to circumstances, and the hoofs rasped down and trimmed as required.

The feet should be washed out daily. It removes filth and prevents thrush in the hind-feet, and in the case of the fore ones supplies the moisture necessary for preventing brittleness of the hoofs. Stuffing the soles every night with moist clay, or with a mixture of clay and cow-dung, is very useful in supplying the necessary moisture. The cow-dung, although a favourite application, should be discarded. It is a filthy application, and its only use is in supplying moisture, which is much more rapidly absorbed by the sole and frog than by the wall of the hoof. The application of dressings to the hoofs is beneficial when they check evaporation and prevent drying of the horn. Almost any greasy substance is useful. Vaseline and lanoline may be used, but oils are not satisfactory. When the dressing is intended to prevent soaking of the hoofs with water, wax or resin may be melted up with it. But it is almost impossible to keep the hoofs of idle horses healthy if confined to the stable, especially if standing in stalls; and moderate work is favourable to the growth and development of the hoof.

Deformities of the Hoofs in the adult Horse—Flat Feet.

Flat feet may be either congenital or acquired—*i.e.*, they may be naturally flat from birth, or the flatness may be due to disease or mismanagement in shoeing. But a naturally well-formed hoof, although the sole may come down, never becomes so flat as when the natural conformation is flat. It is by far most common in heavy horses, and most so in horses bred and reared on soft moist land, on the fens and low-lying districts. In flat hoofs the angle formed between the sole and wall at the toe is very acute, and the depth of the hoof from the coronet to the toe is comparatively very much greater, and out of all proportion to the depth at the heels (fig. 126, p. 250). As a rule, it is generally the fore-feet that give trouble, although flat hind-feet are not uncommon.

Although quite a natural conformation in some horses, when very flat they ought to be considered an unsoundness—*i.e.*, if there is no distinct concavity of the sole, or if, instead of being concave, it is convex or below the level of the lower border of the wall. Such hoofs quite unfit the animal for fast work, and render him much more liable to go lame from bruised sole, corns, sandcrack towards the heels, &c., when put to hard work on our paved streets.

They require to be frequently and carefully shod. They grow so rapidly towards the toe that the weight of the animal is apt

to be nearly all thrown on the heels, unless very carefully attended to. They have always weak heels, and are always weak feet. In preparing the foot for the shoe, the shoer, knowing the weakness of the heels, tries to save them by "springing the heels"—*i.e.*, bending the ends of the branches downwards away from the hoof, and by paring down the heels so that a space is left between the shoe and the hoof. The paring down of the heels only adds to the evil, and the same end may be attained by paring down the hoof round the toe, and saving the quarters and heels. In fact, in preparing the hoof for the shoe, nothing should be pared off the sole except loose horn, and the same with the frog. The heels should not be touched except to be levelled, unless the lower border of the wall is curled in towards the bar—a thing that frequently occurs—when it should be pared out. But they should not be pared or rasped down.

On the other hand, as the hoof grows so much towards the toe, and as far back as the quarters, a shoe considerably smaller than the outline of the hoof should be selected, and the toe-clip may be let much farther back than in a normal angled hoof, so that there is much more hoof to remove round the anterior part of the foot after the shoe is nailed on than in a well-shaped hoof; besides, the larger area that the shoe has to encircle, heavier iron is required, making a much heavier shoe, and more difficult to keep on. The weak sole requires more protection, more cover, a shoe broader in the web; and while a level bearing surface is maintained when possible, the shoe should be well dished out towards the inner border, so that it may not come in contact with the sole much inside the white line. The ends of the branches should not be cut too short—the hoof grows so rapidly forward—and should be perfectly level on their bearing surface. But where the wall is spreading out round the anterior half of the hoof until a separation between the wall and sole is threatened, the bearing surface ought to get an inclination inwards all the width from the outer border to oppose the tendency to spread. A side clip is often useful in maintaining these big shoes in position, and while good holds should be obtained no more nails should be used than are requisite, as the hoof is never so solid as a normal one.

Horses with very flat feet should not be shod with calkins if possible: the frog and sole ought to support some weight. If not, if set up on calkins, the condition known as "dropped sole" is likely to result. In common parlance, the horse is said to be "down in his soles." Instead of the sole being concave, a considerable convexity results, and the condition is very much intensified. This is owing to the calkins removing all pressure from the frog and sole; they don't come in contact

with the ground, and, owing to the obliquity of the wall of the hoof, the weight of the animal pressing on the os-pedis, and through it on the sole, tends to increase the convexity of the latter. When this condition exists, it unfits the animal for anything but slow work — I had almost said on soft ground. In a flat foot the frog, as a rule, looks large and prominent, but there is not much horn on it: it is what is known as "a fleshy frog," but if utilised to support weight it becomes stronger.

With a convex sole even heavier iron is required to make the shoe. This is to enable the workman to keep the outer border of the shoe thick, and leave the shoe well seated out, broad in the web, and thin at the inner border, to give cover and protection to the sole, without the sole resting on the shoe (fig. 148).

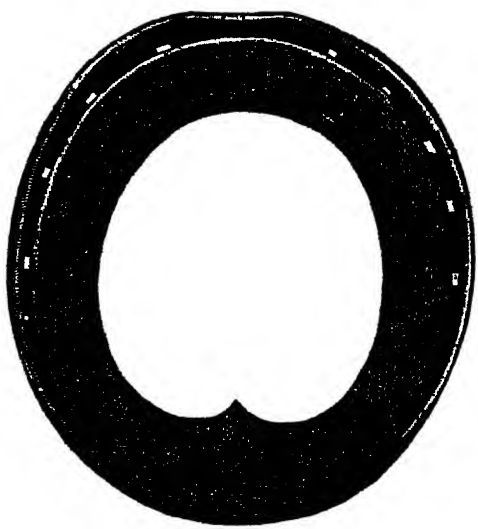


Fig. 148.—*Round or bar shoe.*

But with a hoof of the form indicated, a bar shoe is almost essential; in fact, a flat foot without any distinct convexity of the sole, but with weak heels, is often benefited by the application of a bar shoe. With a bar shoe the weight can be in great part transferred from the heels and posterior part of the quarters to the frog, and, as a rule, the frog is benefited by the pressure. A leather sole is generally beneficial, and with it a dressing of tar and a little tow can be applied. It is a mistake to think that tar applied in this way favours the growth of the horn; but the leather sole protects it from wear and the tar from alternations of moisture and dryness. No horn can be shed, therefore, until the shoe and sole are removed.

The leather also, by being softer and more yielding than the iron, tends to equalise pressure, and some weight can generally be borne by the outer border of the sole just inside the white line. If this can be borne by the animal it is generally beneficial, as it tends to prevent any further descent of the sole.

In making a bar shoe it is necessary to have it practically fitted before the ends of the branches are welded together. In doing this several applications of the hot shoe to the hoof may be required. As the sole is usually thin, it is better to repeat these applications rather than run any risk of burnt-sole. In welding the ends of the branches, it is better to have the shoe too small than a little too large. It can easily be made larger by thinning it a little towards the heels, but it cannot be made smaller without cutting it again. In welding the branches also the form of the hoof should be carefully observed. A smaller shoe comparatively will be required for a naturally flat foot—an acute-angled hoof—than for a well-formed hoof with dropped sole. It will be advisable to remove more horn around the anterior part of the foot after the shoe is fixed on in the former case than in the latter. On the other hand, a bar shoe should never be too short. The bar should not be too narrow, and should be as far back as to meet all possible pressure from the bulbs of the frog. While the frog is all fitted to sustain pressure, the posterior part of it is most so, and, as a rule, it is bad practice to weld a bar across between the branches of an ordinary shoe just in front of the calkins. It crosses the frog too far forward.

Sometimes when the sole is very prominent and tender, more especially in cases of dropped sole, it is necessary to put a toe-piece and calkins on the bar shoe to protect the sole from pressure by raising it from the ground.

Upright Hoofs.

Hoofs too upright are often due to natural conformation, and it is generally a questionable policy to interfere with them (fig. 128, p. 250). But they frequently result from chronic sprain or contraction of the flexor-tendons, causing the animal to walk on its toe, while there is a want of pressure on the frog and heels, which tends to induce sandcrack. As a rule, it is bad policy to relieve the tendons by raising the calkins, but they should not be interfered with without the advice of the veterinary surgeon. When the stumpiness is due to excessive wear at the toe in unshod horses, or to neglect in "dressing" down strong heels properly, tips may be used to remedy the condition. Or a shoe applied rather thinner towards the heels, strong at the toe, with

the outer border bevelled outwards and downwards nearly in line with the wall of the hoof, and a strong toe-clip drawn up.

Contracted Hoofs.

The whole hoof may be smaller than its fellow, or both may be smaller than natural, but, as a rule, it is the posterior half of the hoof that becomes contracted. The walls of the hoof from the quarter backwards assume an abnormal obliquity downwards and inwards, so that the posterior part of the hoof is narrower at the solar surface than at the coronet. When the foot is lifted it is obvious that the frog is small and shrunken, especially at the bulbs, that the angles of the wall as they curve forwards to form the bars are too near each other, too close to the frog, and seem to compress it, and that the clefts are narrow and deep. The principal cause of contraction is shoeing. It may occur from horses standing too long idle in the stable, and it is a very common result of lameness in some other part of the limb, the saving of the limb, resting mostly on the toe, and the want of pressure on the posterior part of the foot favouring contraction. But apart from lameness it is mostly due to shoeing. There are two principal causes for this:—

(1) *The want of frog pressure.*—Although the pernicious practice of paring away the frog is not so common as it used to be, still even when flat shoes are used it is very seldom that there is much pressure on the frog when the horse is used on our macadamised roads and paved streets. Then how much less must it be when calkins are used? There is simply none.

(2) *The seating or dishing of the shoe.*—It is very common for shoes to be made without a level bearing surface in which the hoof can rest. The tendency is to have them more or less inclined inwards from the outer border. And when this seating is carried too far back towards the heels, where some expansion of the hoof takes place when weight is thrown upon it, it is easily seen how it favours contraction by tending to prevent the normal expansion of the hoof. The effect of this is intensified by the branches of the shoe being fitted to project from under the hoof from the quarters backwards. The wall of the hoof, if it rests on the shoe at all, rests towards the inner border where the seating is most pronounced. This is most likely to occur when the hoofs are already contracted, and adds to the evil.

I have seen horses shod in this way in which the ends of the branches of the shoe were outside the heels of the hoof altogether, so that there was nothing for the heels to rest on. The posterior part of the hoof was simply wedged in between the

branches, and everything tending to favour contraction. It is by far most common in the fore-feet, and is a fruitful cause of corns, thrush, sandcrack, and other ailments.

Sometimes the contraction is confined to one side—one heel only being contracted or "wired in." This is frequently the case when side-bone is present on one side of the coronet only, and the toes being turned either out or in favours unequal contraction. Flat feet are much more liable to contraction at the heels than normal ones. The toe of the hoof lengthens so rapidly that an increasing weight is thrown on the posterior part of the foot, and the obliquity of the wall at the heels, sloping forwards and inwards, tends to increase under the increased pressure.

The walls of the hoofs—the horn fibres—are much less able to support weight when oblique than when nearly vertical.

Treatment for Contracted Hoofs.

Preventive treatment is of more importance and of more use than curative treatment, and the principles of preventive treatment have already been indicated in pointing out the causes. The frog should be protected and cultivated as much as possible, nothing but loose ragged horn removed, and pressure brought to bear on it if it can be done. Then care should be taken that the seating of the shoe is not brought too far back towards the ends of the branches, that the branches are not narrowed towards the heels, that the bearing surface is perfectly level, not sloping inwards, and that the horse is not allowed to go too long without being re-shod or his shoes removed.

Once contraction is present other measures are required. In flat feet with contracted weak heels bar shoes are beneficial,—a broad bar so that a considerable part of the frog is exposed to pressure; and while the shoe should be made wider towards the heels than the width of the hoof, little or no pressure on the heels should be permitted until they become stronger.

In more upright hoofs the walls should be well rasped down to leave the frog as prominent as possible, the branches of the shoe kept wide towards the heels with an almost level bearing surface all the width, but inclined slightly outwards. In cases where only one heel is contracted only one branch of the shoe requires to be made in this way, and it should project as far from under the wall towards the heel as to meet a vertical line drawn from the hoof at the coronet. Strong, fairly upright hoofs, if the animals are working on macadamised roads or on land, might be shod with tips to allow pressure on the posterior part of the foot. A good plan is to remove the shoes, rasp the walls well down, and turn the animal out to grass if it is worth

the time. The soil being wedged into the clefts and pressed into the concavity of the sole, with plenty of pressure on the frog, has usually a most salutary effect on the hoofs.

Various operations are performed in the way of cutting the hoof in the region of the quarters and heels, and removing pressure from the wall below to allow expansion to take place at the coronet, when it must be allowed to grow down. In suitable cases, even where lameness exists, this, as a rule, gives very good results. A shoe jointed at the toe, nailed well back towards the heels, with a screw between the ends of the branches to cause forcible expansion, has been recommended. And one jointed at the quarters with clips drawn up on the internal border of the branches at the heels, so as to catch on the bars, each clip being in the cleft of its own side, and a screw used between the ends of the branches in the same way to cause forcible mechanical expansion. But these operations and forcible expansion shoes should be left to the veterinary surgeon.

The various rubber pads made are nearly all more or less useful in aiding expansion of the heels, as are also leather soles with plenty of stuffing, even apart from the extra advantage of a bar shoe.

Roughing or Sharpening.

During winter, when the temperature may be below the freezing-point for weeks, or there may be only occasional snaps of frosty weather, and the streets and roads become coated with ice, it is necessary to employ some means to enable horses to be used with safety. In our changeable climate, in which the temperature is often above and below the freezing-point on alternate days, and even several times in the same day, this is much more difficult than in many Continental countries where the weather conditions are not so variable.

It is easy keeping horses roughed when there is a sufficient coating of snow or even ice to prevent the sharps going through to the granite sets in our streets, or even to the macadam, compared to what it is when our streets and roads are bare, or when it is freezing and thawing alternately every twenty-four hours. Up to a comparatively recent period the most common form of roughing was to remove the shoes, heat the calkins, and draw down a wedge point on each sufficiently fine to cut the ice and prevent slipping. With flat shoes the ends of the branches were turned down sufficiently to make a short wedge.

As iron is too soft to be very durable, a piece of steel may be driven in to each calkin and welded. When sharpened they can then be tempered and stand much longer. In draught-horses wearing toe-pieces the toe-piece is also sharpened,—not,

as a rule, all its length, but about an inch at each end. A piece of steel may also be welded into the toe-piece. Sometimes toe-pieces are altogether made from a special kind of steel prepared for the purpose. Draught-horses, and horses that have much pulling, have a more satisfactory footing with sharps at the toe of the shoe as well as sharpened calkins. In all forms of roughing the sharps should be kept as short—as low—as possible; and in sharpening the calkins, while the external one is sharpened transverse to the branch of the shoe, the internal one should be parallel to the branch, the inner surface of the wedge perpendicular to the inner border of the branch and the outer surface bevelled away to meet it. This diminishes the risk of the sharpened calkin coming in contact with the coronet or fetlock of the opposite limb. Sometimes the inside calkin is left unsharpened, owing to the risk of injuring the coronet of the other foot; but on paved streets, or when the frost is very hard, it makes a very uneven and unsatisfactory support.

If, as many think, shoeing of any kind is a necessary evil, roughing may be looked on as that evil intensified. The form of roughing just described, if repeated twice or thrice a-week for several weeks, invariably injures the hoofs. As a rule, it is done in a hurry, and the frequent pulling off, nailing on, and rasping cannot fail to damage the hoofs. And unless the hoofs are good they will not stand several roughings within six or ten days without distinct injury.

In flat shoes the shortening of the branches necessary to form the sharps is injurious to the hoofs, and if repeated several times tends to produce corns and bruised heels. The heightening of the calkins at a time when they cannot penetrate the ground very far, puts the horse still more on stilts, while the shortening of the shoes already referred to adds to the unsatisfactory nature of the base of support. This fault pertains more or less to nearly all methods of roughing. Then they cannot be removed when the horse is in the stable, and if he is necessarily idle and standing about, he has more chance of injuring himself and others. It also takes some time to get a horse roughed. Going to and from the forge, and sometimes waiting in a crowd for an hour or two, when a sudden frost comes, before receiving attention, all add to the cost. I have seen a horse roughed by a single workman without being over twenty minutes within the forge door, but that is very exceptional and cannot be expected.

Still this system is far from being given up, and for heavy horses, where steel is used in the calkins and toe steel in front, it is often the cheapest in the end. It must be remembered that many of our frosty snaps do not last over forty-eight to seventy-two hours.

Another of the older methods of roughing is by the use of

frost-nails. This is not satisfactory for heavy horses, but for roadster horses on country roads it is fairly serviceable. The nails are made with tempered steel heads of various shapes—diamond-pointed, chisel-pointed, and square or slightly oblong (fig. 149). Two or more nails are withdrawn from each foot, these frost-nails inserted, driven, and clenched in the usual manner. The heads are larger than those of the ordinary nails, so as to project beyond them, and the square or oblong headed ones are the best, they last much longer than the others, and when the heads are properly hardened are always sharp enough to cut, to take a grip on the ice. If the heads are too large, or if they do not fit the "fullering" and punching of the nail-holes, they are apt to break off. But when properly fitted I have found a set last a couple of fair journeys on country roads.

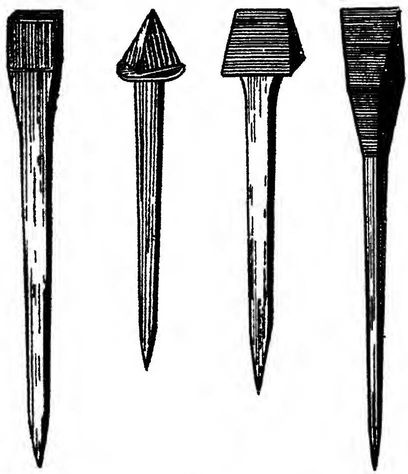


Fig 149.—*Frost nails—various.*

A form of nail which has been dignified with the name of "stub" is largely used for roadster horses in some districts (fig. 150). It is larger in the head than the frost-nail, and has a short tapering shank, thick at the neck. Special holes are punched in the shoes, often four in each—one at each heel, and one at each side of the toe. The holes are punched in the usual position below, but are sloped outwards so as to emerge just within the outer and upper border of the shoe. The shank of the stub, therefore, does not enter the hoof at all, but the point is simply turned down over the outer border of the shoe. They are no use for heavy horses with calkins, and unless the counter-sinking of the hole fits accurately the neck and lower part of the head of the stub, they are apt to work loose; in fact, they are sufficiently difficult to keep in position.

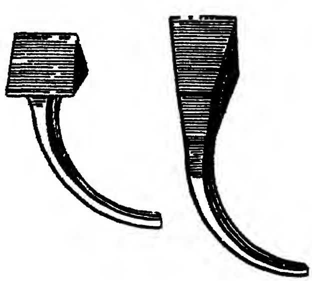


Fig. 150.—*Frost stubs.*

Another method of roughing is by means of steel frost-screws. These frost-screws are made either diamond- or chisel-pointed—as a rule, the latter being most satisfactory (fig. 151). They are made in all sizes, from three-eighths to five-eighths of an inch, and are mostly used in flat shoes, perhaps fully as heavy as usual, and of good iron. The holes are punched with a drift while at a red heat and the screw cut with a tap when cold. As a rule, one is used for each heel; and in horses used for draught purposes it is not uncommon to insert a smaller one at each side of the toe. For horses that have to trot at their work, if used at the toe at all, they ought to be as low as possible.

Frost-screws are extremely useful, and ought to be easy of application, so that any ordinary groom, furnished with a wrench, could remove the worn and blunted screws and insert sharp ones. But, like all forms of roughing, they have their disadvantages. It is difficult getting them sufficiently

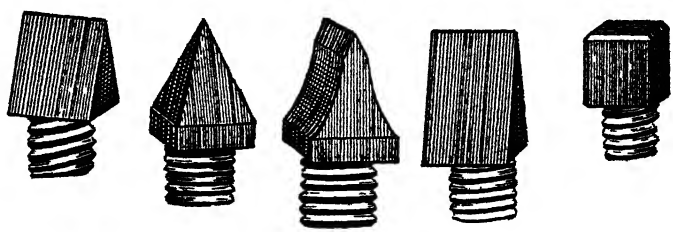


Fig. 151.—*Frost-screws.*

low, and when high they make a tottery support. They are not very cheap, and occasionally break off at the neck, leaving the shank in the shoe, which cannot be removed without removing the shoe. They are apt to get loose and become lost. If removed when not required, the edge of the hole in the shoe gets burred or wried so that the screw cannot be reinserted without removing the burr with a tap. Square-headed screws, called blunts, blanks, or dummies (fig. 151), are used to keep the holes open when the sharps are removed; and if left long in, either sharps or blunts are apt to rust and be very difficult to remove. Still they are very useful when accurately fitted, and ought to be available to be inserted by the groom in a few minutes.

Mr Malcolm, veterinary surgeon to the Corporation of Birmingham, informs me that he has practically overcome these difficulties in the utilisation of frost-screws. Instead of punching the hole in the shoe while hot with a drift, he has the holes drilled afterwards in a lathe, and in this way he gets a truer and more uniform hole. Not only is the hole drilled for the screw, but a level bed is drilled for the shoulders of the screw to rest on

before it is removed from the lathe (fig. 152). A level bed might easily be got by punching the hole, but the difficulty in punching is in having the hole at right angles to the surface of the branch. And when one or even two corners of the screw only rest against the shoe, it can easily be understood that the risk of the screws becoming loose or breaking at the neck is a very real one; undoubtedly it is very common. It can as easily be seen that with a level bed perpendicular to the hole for the screw, so that the shoulders all come into solid contact with the branch, the risk of screws breaking or becoming loosened and lost must be immensely reduced. Mr Malcolm assures me that they have very little trouble with loose or broken screws. They use them on their heavy horses with stamped shoes, and insert dummies when the sharps are not required, and that they are all that could be expected. They use a sort of wrench, with a long handle to grasp a branch of the shoe, and hold it firm and immovable when tightening or loosening the screws. This prevents any twisting of the shoe or foot, or straining of the nails.

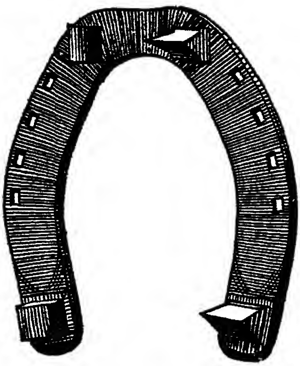


Fig. 152.—*Birmingham shoe.*

Steel Frost-Cogs or Studs.

I think there is little doubt but these are now more largely used for roughing horses in this country, especially roadster horses, than any other system. When first used they were made with round shanks; now they are mostly square or octagonal. But the first I had were made by the blacksmith who forged the shoes out of a circular steel rod, flattened at one end into the shape of a blunt arrow-head or drill, and then cut the desired length. The holes were punched in the hot shoe and made the required size by a drift tapering to each end.

The cogs used in Britain are now nearly all manufactured in the Black Country, by workmen who make a speciality of the work. The square and even octagonal cogs are made of all sizes, the shanks from a quarter inch to half an inch, there being three sizes between, with, of course, different-sized heads to correspond. The shanks are made with a taper of about one in ten, but the holes made in the shoe to receive them should be of uniform diameter throughout. In making these

holes after the shoe is made, the holes are punched from the ground surface of the shoe after the ends of the branches are again heated, by an ordinary punch a little less in diameter than the shank of the stud. This should be done over a very small hole, in a matrix, if the anvil has not a suitable one, as the less burring there is on the edge of the hole the better. If there is much it should be filed off, as if hammered down it causes an uneven surface in the hole, so that the cogs do not fit so well.

This done, the shoe should be fitted, then the ends of the branches are again heated to a dull red and the drift made to suit the cogs driven quite through the branch. In doing this, care should be taken that the drift is held perfectly perpendicular to the branch of the shoe, so that the hole may not be askew, and the branch of the shoe not twisted in doing it; the stud should then be inserted in the hole to ascertain how it fits, and should enter to within one-twelfth of an inch of the shoulder. As iron contracts in cooling, the stud will not enter so far when the shoe is cooled without being driven. Any burr now remaining should be filed off and not touched with the hammer. The drifts used for finishing the holes are not long in wearing out, so that they become too small and must be renewed. Hence the reason for always trying a cog in the newly finished hole while hot.

The cogs are driven into the holes after the shoe is nailed on, and the shoulder of the cog should always reach within one-twelfth of an inch of the surface of the shoe, certainly never nearer than one-sixteenth. If the shoulder touches the branch the cog will soon work loose and fall out. In driving in the second cog the first is apt to spring out if it is not grasped and steadied by the finger and thumb; and the same with any subsequent cogs if there are any at the toe. If at all sharp they should be removed when the horse is in his stable, to prevent him injuring his own coronets, or other horses, by kicking at them. And if left in for several days they become rusted and are very difficult to remove. If a thaw results before the cogs are much worse they should be removed, and blunt, dummy, or worn ones inserted to keep the holes from burring. If that is not done, and the horse doing ordinary work for some time, the cogs cannot be reinserted without a punch being used to remove the burr, and the cogs seldom remain so well in afterwards.

To remove the cogs it is usually sufficient to give each a knock with a hammer from side to side, seize it with sharp pincers close to the shoe, and while pulling give the branch of the shoe close to the cog a smart blow or two with the hammer. A forked wedge, the fork to embrace the neck of the shank, is very

useful in springing the studs. It is convex on the surface put next the shoe, and slightly concave on the side next the shoulders of the stud. It is difficult using it on shoes with fixed calkins and toe-pieces, but easier in all cases when the cogs are slightly rounded at the shoulders (fig. 153).

Cogs have several advantages over screws, and have certainly displaced them in ordinary use to a very great extent. They are simpler and easier to use, and are more easily made and cheaper. They can be made shorter—lower—and don't raise the foot so far off the ground, and they never break off at the neck. On the other hand, they often become loose and are lost. In my experience they are not much worse for this than screws. When they become lost it is, as a rule, due to being improperly fitted. I have seen workmen tightening them by using a little tow, or a piece of rag in the hole along with the stud. Such a thing is an abomination. They could not be expected to go a mile from the forge door. A worse fault is the difficulty of their removal

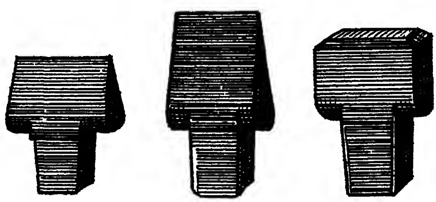


Fig. 153.—*Frost-studs.*

if left too long in position. There is not often much difficulty with the horse-shoer, but with the groom or ordinary driver hammering away at them, a spirited horse is apt to become restless, and it may result in spoiling him for shoeing or manipulating his feet in any way.

For draught-horses wearing calkins and toe-pieces cogs are often inserted right in front of the calkin. Chisel-shaped cogs with longer heads are used, so that when newly inserted the point of the cog should project from a quarter to five-sixteenths of an inch beyond the calkin. These cogs are made for the purpose, so that in ordering cogs from the manufacturer high or low cogs are ordered according to requirements.

Draught-horses working on fairly level roads or streets keep their feet wonderfully well with these without any sharps at the toe. But on hilly roads sharps at the toe are all but essential. For this purpose nothing so satisfactory as the cogs for the ends of the branches has yet been met with, and in this more than in anything else the old plan of roughing has the advantage.

One method is to weld on to the shoe a double toe-piece with a wedge-shaped opening between, wider at the surface of the

shoe than at the surface of the toe-pieces. Into this opening between the toe-pieces is driven, from the end, a piece of a thin steel bar, an inch broad, and thicker at one side than the other, the thin edge of course being that which now projects beyond the level of the toe-pieces. This gives a fairly satisfactory grip, and when well fitted seldom becomes displaced. But the double toe-piece is undoubtedly difficult to fit; it makes a rather expensive shoe, and the method does not seem to be gaining ground in the country.

Cogs are sometimes used along with toe-pieces. The shoe is forged out of a broader bar than usual, the branches drawn somewhat, while it is left broad round the toe. A rather smaller toe-piece is welded on, pretty well forward, and a hole is punched in each side behind the toe-piece—usually for smaller cogs than are used at the heels (fig. 154). This system is used with van- as well as cart- and lorry-horses, but is not very satisfactory. Its worst fault is that it shortens—diminishes—the base of support to a quite appreciable extent. This does not take place to anything like the same extent when heel-and-toe cogs are used in flat shoes.

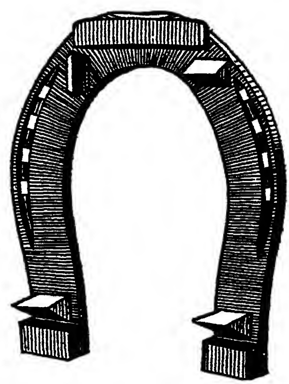


Fig. 154.—*Heavy shoe with studs fitted.*

Some of our manufacturers, in their efforts to find a more satisfactory toe-grip, have introduced what might be termed movable toe-pieces. They are simply elongated studs. An oblong rectangular hole or slot is punched in the toe of the shoe, and into this a toe-piece is driven, the ends of which project considerably beyond the slot. It is used either sharp or blunt. Some manufacturers make them with square or octagonal shanks, but they are less satisfactory than the other, owing to the leverage on the ends of the toe-piece. But none of them are very satisfactory, owing to their tendency to become loose and get displaced. Being single and situated at the toe, a greater strain is thrown on them, especially in climbing hills, than on the calkins at the heels; and a more satisfactory method would receive a cordial welcome.

Sharps, both screws and studs, are occasionally removed and sharpened after being worn and blunted, screws more frequently than studs; but "the game is scarcely worth the candle," and inventors have used their wits with considerable success to provide sharps which will wear longer before becoming blunted.

The best of these are perhaps those with the cutting edge like the capital letter H, those with it in the form of a cross (X), and those in the form of the letter Y (fig. 155). Owing to their shape, they can be made so thin that they will cut the ice until quite worn down.

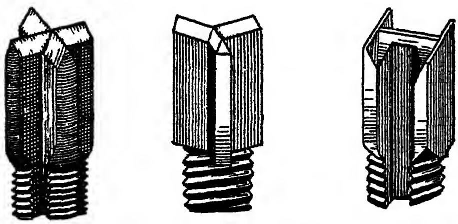


Fig 155.—*Improved frost screws*

Pads of various kinds are used to prevent slipping, but none of them are very reliable on ice. One of the best is the rubber bar pad, which is used with a shoe cut off at the quarters, so that the posterior part of the foot rests entirely on the rubber. A horse might walk safely on ice with this pad were it not for the "take off," the toe slipping just as the foot is being lifted.

The rubber acts in the same way as the frog in an unshod horse,—an unshod horse walks fairly well on ice without slipping, much better than a bullock,—the rubber, by its elasticity, yielding and gripping the ice. The most generally useful pads have the rubber cemented on to leather soles, and are often very useful in cases of bad corns and weak contracted heels.

These pads are fastened on with the shoe in the same way as a leather sole, but others are made which are only intended to be worn while at work, and removed when the horse returns to the stable. They are mostly held in position after the manner of a slip sole, and are more convenient in the case of thrushes, or where frequent dressings to the frog or sole are required; and while some are meant to diminish concussion, others are meant to prevent slipping.

INSECT ATTACKS IN 1899.

By Dr R. Stewart M'Dougall, Consulting Entomologist to the Society.

In communicating my report for 1899, as in my report for 1898, I pass over without mention those insects inquired about when there was at the same time no record of serious damage, and confine myself to giving details that may be helpful to Members generally concerning the recognition, life-history, and methods of prevention and cure in relation to insects complained of which are capable of causing much loss.

The Goat Moth (*Cossus ligniperda*).

The family Cossidæ, Goat Moths or Carpenter Worms, is made up of moths whose caterpillars bore galleries in trees. In Britain we have two members of the family—namely, the Wood Leopard Moth (*Zeuzera æsculi*) and the Goat Moth (*Cossus ligniperda*) (fig. 156). The caterpillars of the Wood Leopard Moth have been taken from a number of different fruit and forest trees. In spite of the moth's name, *æsculi*, derived

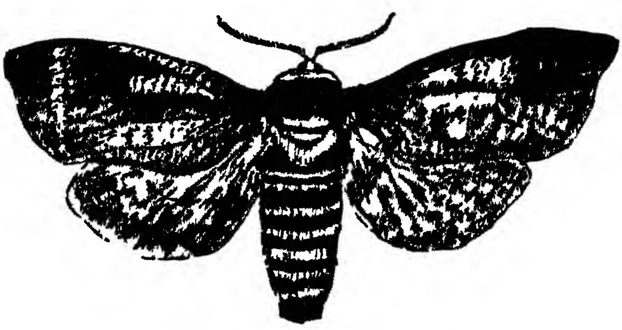


Fig. 156.—*Cossus ligniperda.* (Natural size.)

from the horse-chestnut, Æsculus, it does not seem to be recorded so often attacking horse-chestnut as other trees. However, at Murrayfield, near Edinburgh, and at Dolphinton, Peeblesshire, some years ago, I obtained quite a number of specimens of the damage of the Zeuzera caterpillars to horse-chestnut, the branches of which in many cases had broken through where the caterpillars had tunnelled them.

It is the other member of the family, however, that I wish to draw attention to on the present occasion. Last year I had

specimens of the Goat Moth caterpillars sent to me from near Forres, where they were doing damage to birch-trees, some of which had died as a result of the attack. This year the example of injury sent to me was on poplar.

It is in the larval or caterpillar stage that *Cossus ligniperda* is injurious. The damage is twofold. The borings made by the caterpillars interfere with the vital processes of the tree, and may cause its death; and often the wood, from the size and extent of the galleries gnawed by the caterpillars, is rendered quite useless for technical purposes.

The large and plump moth is fairly common in Britain from Ross southwards, and in Ireland. The female is $1\frac{1}{2}$ inch or a little more in length, and measures over 3 inches in expanse of wing. The male is somewhat smaller. The head is small and the eyes large; proboscis and antennæ short. The antennæ of the male are markedly comblike, those of the female sawlike. The thorax is bordered with black posteriorly. The fore-wings are pale whitish-brown with a network of dark-brown lines. The hind-wings are darker. The segments of the abdomen are grey with whitish rings. The thick brown chrysalis has little spines on the dorsal surface of some of the segments.

The somewhat flattened caterpillar has the typical sixteen legs of the Lepidopterous larva (fig. 157). It is red on the

Fig. 157.—*Caterpillar of* C. ligniperda. (Natural size.)

upper surface, and of a yellowish flesh-colour on the sides and under surface. The spiracles are brown and the head black. On the second segment there is a dark shield; the segments have fine bristle-like hairs. The length of the full-grown caterpillar is 4 inches. The caterpillars give off a strong odour, compared by some to that of the goat, by others to the odour of acetic or salicylic acid. I have known an entomologist to find a caterpillar-infested tree, attracted by the odour alone. The caterpillars infest many broad-leaved trees—willow, poplar, walnut, alder, oak, birch, beech, elm, lime, ash, sycamore, and various fruit-trees. They are commonest in the softer woods.

The female lays a little heap of eggs in cracks in the bark at the base of the tree, and attack is always worst in this position. Grown stems are preferred to very young trees; isolated trees or those in an avenue or at the edge of a wood are chosen in pref-

erence to trees in close growth. The young caterpillars feed at first below the bark, but later each caterpillar gnaws out for itself in the wood an ascending irregular gallery. Where the caterpillars are numerous (and over one hundred have been taken from one stem) the wood is completely riddled.

Caterpillars which hatched out, say, in July 1899, will continue their life in the tree all 1900 and on to May 1901, when they will pass into the chrysalis stage (fig. 158), which lasts from three to six weeks according to the weather. Including a month for the hatching of the eggs, the life-cycle of *Cossus ligniperda*, from egg-laying till the appearance of the moths of the next generation, extends to two years, and in the north in severer climate this time may be lengthened.

Fig. 158. — *Open chrysalis of* C. ligniperda *removed from cocoon.* (Natural size.)

The full-fed caterpillar becomes a chrysalis in the tunnel in the tree where it has fed, the chrysalis being enclosed in a cocoon of wood chips; or the caterpillar may leave the tree and become a chrysalis in the ground. The attacked poplar, a section of which is seen in fig. 159, was growing in a garden, and in the soil of one of the beds not far from the attacked tree I found a chrysalis enclosed in a cocoon formed of particles of the garden soil. Whether in tree or soil, at a later stage the chrysalis pushes itself forward some way out of the cocoon, and when the moth has issued the ruptured chrysalis can be seen sticking out of the tunnel in the tree or projecting from the soil.

The moths fly in June and July, and should be killed when seen. But, at rest on a tree, the moth easily escapes recognition, as its habit of holding on with its hind pair of legs only and leaning back somewhat, supported by these and the edges of the wings, give the moth the appearance of a lopped-off branch. Badly infested trees should be felled, split, and the enclosed caterpillars destroyed.

Protection against egg-laying may be afforded by streaking the lower part of the stem with some mixture such as clay and cow-dung.

The following is a recipe quoted by Nitsche as in use on the Continent, with good result not only against *Cossus ligniperda* but other insect enemies of the forester: "Infuse 5 lb. of tobacco in half a pailful of warm water and allow to stand for twenty-four hours; then strain. Mix the infusion with half a pailful of ox's blood, and add one part of slaked lime and six-

teen parts of cow's excrement. Allow this mixture to remain for a short time in an open cask so that it ferments, and stir several times daily. Clean the base of the stem, removing some of the earth at the bottom, and paint on the composition. Repeat the painting three days in succession, and a crust is formed on the stem which rain does not wash off, and which does not harm the tree."

Fig. 159.—*Transverse section of Poplar to show the workings of the Goat-moth caterpillars.* (One-half natural size.)

Fig. 160 is a representation of the Goat Moth which had afterwards been used by a fungus to spread through the wood.

The Genus CHERMES *and its Attacks on Spruce, Larch, Pine, &c.*

The genus Chermes belongs to the group of Aphides or Plant-lice, a group of great interest to the biologist as regards details of life-history, and well known to the agriculturist, horticulturist, and forester from the ravages committed by many of its members.

The Woolly Aphides number among them some extremely troublesome and noxious forms, and never a year passes without my receiving from Members of the Society, seeking remedies,

specimens of pine or larch or spruce or silver fir attacked by these aphides. During the past year I have been fortunate enough to get some experiments carried out as to methods of procedure against these pests, but preparatory to giving an account of these I wish to say something of the life-history.

The genus Chermes is the one to which the plant-lice affecting spruce, larch, pine, and silver fir belong. The insects in question are provided with a proboscis by means of which they prick the buds and give rise to galls, or pierce the needles, causing them to become kneed, or the bark, exhausting the plant of its juices, the result being a gradual weakening and an unhealthiness that may be followed by death. As the pests feed with the proboscis sunk in the tissue of the plant, poisoning the outside of the food-plant is of no avail; they must be killed by spraying on them something which will cause death by contact with them, or will choke up their breathing-pores which open to the outside on the surface of the body.

Fig. 160.—*Tunnel of caterpillar of* C. ligniperda *in longitudinal section. The tunnel is seen filled with the rhizomorphs of the injurious fungus* Agaricus melleus. *Fungus attack had followed the insect attack, the fungus taking advantage of the caterpillar borings to spread through the wood.*

For a long time it was thought that the Aphides which attacked spruce, larch, pine, and silver fir were individuals belonging to independent species, but research has shown that from galls produced on the spruce a generation may issue which may wander to larch or pine or silver fir, whence after a stay of some time a descendant generation returns to the spruce as the originator of a new cycle.

There are three kinds of galls made on the spruce by members of the genus Chermes—viz., *Chermes abietis*, *Chermes strobilobius*, and *Chermes coccineus*. In the case of the first two the plant-lice from the galls migrate to the larch, and it may be the pine, where the next stages in the life-history are passed. *Chermes coccineus* is also thought to have a migrant generation

in its life-history, which generation moves from the spruce to the silver fir and gives rise on it to the woolly aphis called *Chermes piceæ.* Much remains still to be cleared up in the very difficult life-histories of these insects, but as regards *Chermes abietis* so common with us, the following details appear to be well established.

Small wingless grey-green Aphides, which have passed the winter on the spruce, and which may be found under cover of cottony threads, undergo several developmental changes early in the spring, and on the advance of warm weather prick the buds of young spruce in order to lay their eggs. As a result of this pricking the bases of the needles swell and a gall is formed which resembles somewhat a fir-cone, the tops of the needles projecting all over the gall. The gall is hollow, and small yellowish lice which have hatched from the eggs mentioned above wander into the chambers of the gall before these have become closed by growth. Inside, development takes place, and in August the galls, originally green, and now brown, open at the edges and give exit to forms which develop into winged Aphides with black heads and yellowish bodies. These lay eggs on the needles of the spruce under cover of downy threads, and from these eggs hatch wingless forms, the heralds of the galls on the spruce in the next year. In this case, where the round of life is confined to the spruce, there are two generations in the yearly cycle—a wingless generation and a winged generation. In this whole life-cycle only females are represented, and thus we have what the biologist calls parthenogensis—*i.e.*, virgin birth.

But side by side with this life-history we may have another condition where the life-cycle is spread over two years and is represented by five generations. Generation i. of this cycle, as before, passes the winter on the spruce and lays eggs in the spring. From these eggs come Generation ii., which lives at first in the cone-like galls, and ultimately becomes winged. Some of these summer winged forms desert the spruce and fly off to the larch (in Russia to the pine), and, now known as *Chermes laricis,* lay eggs on the needles of the larch.

From these eggs comes Generation iii., little yellow larval forms to begin with, which suck the larch needles for a short time in the autumn and then pass to the bark, under cover of which they live over the winter. Adult in the following spring, they lay eggs from which comes Generation iv.

The young yellowish members of Generation iv.—the woolly form of *Chermes laricis*—perched on the larch needles, suck these and cause them to become kneed. They get wings in time, and in their turn fly back to the spruce, on the needles of which they lay eggs. From these eggs Generation v. results. Genera-

tion v. contains males and females (this is the first time in the course of the cycle that males have been present). Pairing takes place, and from the fertilised eggs of this Generation v. come in late summer and autumn the wingless mothers, which correspond to the Generation i. we started with, and which live over the winter on the spruce, and in the next spring give rise to the cone-like galls.

I had been anxious for some time to carry out some extended experiments which might yield practical hints as to how to combat successfully these too common enemies of our coniferous trees, and an opportunity offered during the year on the estate of Spott, Dunbar. Here a plantation, chiefly of larch and spruce, with some pine, had been attacked by Chermes, and the plants were becoming unhealthy and retarded in their growth. I was consulted about the matter, and Miss Adelaide Watt, on whose estate of Spott the devastation occurred, expressed her willingness to have carried out a series of experiments; and so, early in the spring of 1899, I drew out a list of suggested methods of treatment. These experiments were carried out under the direct supervision of one of my old students, Mr James Stenhouse, a keen observer, and thoroughly interested in the treatment, and in the plantation of which he has charge.

The plantation, formed in 1893 chiefly with young plants of larch and spruce, on good strong loam, is situated on the side of a glen, the aspect being south-east. After the plants were fairly established they grew rapidly and well until the summer of 1898, when they were seen to be badly infested with insects, the larches being in July quite white with the Woolly Aphis. The spruces were also noticed to have galls on them.

Experiment 1.

For this pure paraffin was suggested, the instructions being to use the very finest spray, to chose a clear bright day, and the plants to be dry at the time of spraying.

The danger of pure paraffin to the life of a plant has long been insisted on, and warnings have been repeatedly issued against its use. In some experiments, however, in America recently, pure paraffin was used against the San José scale with reported good results and no damage to the plants. I was anxious to test this on the young conifers, but as there was some risk to the life of the plants, the pure paraffin was only used on a very small area.

On April 15 twenty-four infested trees—chiefly larch and Scots pine—were sprayed with pure paraffin.

Examined and reported on, on May 5, the treatment had been very successful as regards the pines, these being cleared of their

Aphides. At this stage the eggs of the Chermes on the larch had not hatched, and the spray did not seem to have affected the eggs much. The mother Chermes present on the plants were killed by the spray.

On June 15 another lot of twenty-four trees, the eggs on the larch having by this time hatched, was sprayed; and examined on June 30, the plants were found to have been effectively cleared of the pests.

Some larvæ of the pine sawfly which chanced to be on the pines were quite destroyed by the spray.

The young needles of the larch and spruce were scorched somewhat by the spray, but during the season they grew fairly well. Apart from the plants, a possible danger when pure paraffin is being used might be pointed out. Where in a young wood there is abundance of rough grass the latter might easily be ignited by the throwing down of a match. The sprayer, therefore, should not be smoking.

Experiment 2.

Instructions.—Dissolve 1 lb. of soft soap in every gallon of water used.

On June 9 a quarter of an acre of larch and spruce was sprayed.

Examined on June 30, the trees were almost entirely free from insects. Some of the young shoots of spruce were badly scorched, but not the larch.

During the rest of the season the plants remained healthy, the scorched shoots of the spruce recovering somewhat.

Experiment 3.

This was an experiment with paraffin and sour-milk, with a dilution of water, but there was a difficulty in obtaining a mixture of the kind desired. The results were irregular and need not be quoted.

Experiment 4 (*with Paraffin Emulsion*).

Recipe.—Hard soap, ½ lb.; soft water, 1 gallon; paraffin, 2 gallons.

The soap was dissolved in boiling water, and, boiling hot, was added to the warmed paraffin (in heating paraffin great care must be taken in case of fire). The two were then churned together thoroughly till a buttery-like mass resulted, and this was used as the stock. For dilution of the stock four

different strengths were used, and these we shall write of under *A*, *B*, *C*, *D*.

A. On June 3 three acres were sprayed, the stock being diluted with ten times its bulk of water. The result of this, as examined on June 30, was upon the whole satisfactory, although here and there a tree was found badly infested (probably such had not obtained their proper share of the spray) surrounded by other trees quite cleared from the pests. The sprayed trees were healthy and grew exceedingly well to the end of the season (the season was a good growing one), and up till the end very few insects could be found on them.

B. On June 3 half an acre was sprayed, the stock being diluted with twelve times its bulk of water. Generally it may be said that this spray had a fairly good effect, but it was noticed to be less effective than *A*, where the dilution was only ten times.

C. On June 3 half an acre was sprayed, the stock being diluted with fifteen times its bulk of water. This had still less effect than *B*.

D. On June 13 a quarter of an acre was sprayed, the stock being diluted with only eight times its bulk of water. The area sprayed was the most affected of all the areas sprayed, every plant practically being covered with the pests. Examined on June 30, the spray was seen to have had a very good effect, better than any of the weaker mixtures of *A*, *B*, or *C*. Insects were still present on the plants, but to nothing like the same extent as before the treatment.

The Magpie Moth (*Abraxas grossulariata*).

This moth is one of the Geometridæ, a family so named from the looping or spanning method of progression characteristic of the caterpillars. Of the twelve rings which in the Magpie Moth caterpillars follow the head, the first three each carry a pair of legs, the thoracic legs. The only other rings having appendages are ring 9 and ring 12, each of which has a pair of so-called after- or sucker-feet. The ten-footed caterpillar moves thus: it holds on firmly with its thoracic feet, and loosening the grip of its sucker-feet, it brings these forward close to the thoracic ones. The result is the arching of the body into a loop. Then the thoracic feet let go their hold and the body is stretched out preparatory to their taking another grip.

The caterpillars of the Magpie Moth do much harm to gooseberry and currant (red, white, and black) bushes, which they strip of their leaves. Other food-plants are apricot, plum, bramble, blackthorn.

The moth measures 1 inch in length and 1¾ inch in spread of fore-wings. The head is black, the thorax and abdomen yellowish, spotted with black. The front wings are ochreous-white with a number of black spots dotted over them. The hind-wings are ochreous-white with black spots round their margins and other irregular black spots dotted over them. There is much variation, however, in the development of the black markings.

The caterpillar is cream-coloured with a number of interrupted black spots along the centre of the dorsal surface; along each side run two other rows of small black spots. The line of the spiracles is orange-coloured, the spiracles themselves being black. The head and legs are black. Full grown the caterpillar measures 1¼ inch.

The chrysalis, enclosed in a light cocoon, is black, with three yellow rings.

As a knowledge of the times of appearance of this moth in its various stages has an important relation to the measures to be adopted against the Magpie Moth, I subjoin a calendar.

1899.	June	Moth.
	July and August . . .	Moth and eggs.
	August and September . .	Caterpillars feeding on leaves.
	October, November, December	Caterpillars in winter quarters.
1900.	January, February, March .	
	March, April, May . . .	Caterpillars feeding on buds and leaves.
	May, June	Chrysalis, moth.

One year is thus comprised in the life-cycle. The female lays her yellow eggs singly or in little groups of three or four on the under-side of the leaves of the gooseberry and currant. In favourable weather the eggs hatch in a few days, and the caterpillars feed for a short time preparatory to their going into winter quarters. It is evident from the smallness of the caterpillars and the age and condition of the leaves, that this is not the time when the pests do their worst work; but it is the time when the careful observer will get the warning of what is in store for him in the next spring when the caterpillars, unless warred against beforehand, will after their winter's rest start to destroy the young leaves. After feeding, then, for a short time in the autumn, the caterpillars go into hiding for the winter, sheltered in leaves which remain fixed to the plants and have been sown together for the purpose, or in or under the leaves which have fallen, or the caterpillars may go a little way into the ground.

In the next spring they come out of their shelter-places, and crawling on to the gooseberry and currant bushes, feed greedily

till May, when they are full-grown. The full-fed caterpillar becomes a chrysalis in some sheltered place, and the moth issues in the middle of the summer.

Preventive and Remedial Measures.—As has been pointed out above, the careful observer, warned by the appearance of the young caterpillars in August and September, will, on the fall of the leaves, prune the bushes on the twigs of which some of the caterpillars may have ensconced themselves, and burn the prunings and any withered leaves that have not fallen, as such leaves may shelter concealed caterpillars.

The leaves and rubbish below the plants should also be cleared, for here, too, will the caterpillars be, and the ground strewn with quicklime to be dug in. Soot-and-lime (a mixture in the proportion of 2 bushels of lime to 1 of soot) might be spread on the ground below the bushes towards the end of the winter.

Should spring find the pests at work, hand-picking might be practised where practicable.

The caterpillars are killed by a spray of paraffin emulsion. A useful measure is syringing the plants with soft soap and quassia (6 lb. soft soap, the extract of 7 lb. quassia-chips, and 100 gallons of water). The quassia will render the leaves distasteful to the caterpillars, and the soap, adhering to the caterpillars, will choke up their spiracles.

Hellebore is a well-known insecticide, but it is not to be forgotten that it is a dangerous poison, and must therefore not be used when the fruit has formed. There is a danger, too, of the paraffin "tasting" the fruit.

The caterpillars have a habit of sheltering themselves on the under surface of the twigs when the plants are being treated, and care must be taken that they don't escape the dressing intended for them.

THE TURNIP "FLY" OR "FLEA" BEETLE (*Haltica or Phyllotreta nemorum*).

This Turnip Beetle, along with some others which closely resemble it, belongs to the family Chrysomelidæ or Leaf Beetles, so called from the fact that the beetles, both as adults and larvæ, feed on the leaves of plants. The family is one exceedingly rich in species, the habits of most of which are still imperfectly known, but among the species whose habits are known we find many injurious ones.

The genus Haltica, to which our pest belongs, consists of species small in size and characterised by their powers of leaping (hence the name "flea" beetles), the hind-legs being especially modified for this purpose, as the thighs are markedly

thickened. Several out of the large number of the leaping species in Britain have for their chief food-plants the turnip and other cultivated crucifers, and their ravages have caused in our country enormous losses. Miss Ormerod has reckoned that in 1881 the turnip-fly over twenty-two English and eleven Scottish counties occasioned a direct loss of more than £500,000.

Haltica nemorum is a very small shiny beetle measuring from a twelfth to an eighth of an inch. It is black, bluish-black, or greenish-black, with a marked yellow stripe running longitudinally down each wing-cover. The antennæ (a hand-lens should be used in the examination of this beetle) are eleven jointed, the three joints nearest the head being yellow, the others black.

Not only are the bettles excellent jumpers, they are also strong and powerful fliers.

The yellowish biting-jawed grub has six thoracic feet and a sucker-foot at the tail-end.

The beetles pass the winter in the adult stage under cover of weeds or earth clods, and other such shelter-places. Last winter I found a number of them in hiding under the bark scales of the Scots pine.

Coming out in the spring from these hibernating places, they feed and breed on charlock and other such cruciferous weeds till the young turnips are ready. Later the females lay their eggs on the under-side of the rough leaves of the turnip; these hatch in from a week to ten days, when the grub from the egg bores into the turnip leaf and mines in the soft tissue a winding passage, always increasing in size from the place of entrance. In a week the grubs are full-fed, when they drop to the ground, where, a little below the surface, they pass into the pupal condition.

By another fortnight this stage is over, and the now perfect beetles emerge to continue the bad work of the previous generation.

From the comparative shortness of the life-cycle it is seen that there can be a number of generations in the year.

The plants are harmed both by the adult beetle and by the grub. This latter certainly by its tunnels in the leaves weakens the plant by interfering with the conduction of sap, and by the destruction of tissue that would normally have been concerned in the formation of organic foods for the plant, and by interrupting in other ways the normal leaf-functions. But distinctly more harmful is the adult, for in its feeding it shows a great love for the seed-leaves, and for the plant in its earliest stages. This is just the time when the plant is most delicate and least able to withstand injury, hence in fighting against this beetle the importance of sowing good seed—seed that pos-

sesses not only the capacity for germination but also shows a good energy of germination; in a word, the less tardy and drawn out the germination and young stages of the turnip the greater the chance for the plants.

Another general principle is to make as far as possible the environment satisfactory for the plant, and the opposite for the pests, in such ways as—

(*a*) Manuring so as to help on the plants.

(*b*) Preparing the land early and the providing of a good seed-bed, for then the moisture is better retained in the soil, and the plants like moisture, whereas the beetles don't. Moreover, evaporation is greater when the land is "cloddy," the young plants cannot grow so well, and the clods are good shelter-places for the beetle.

Cruciferous weeds, like charlock and runch and Jack-by-the-hedge, should be cleared away, as these afford food and breeding-places till the turnips are ready.

Boards tarred on the under surface, placed on wheels, and run through the fields, will trap many of the beetles, as these in their leaping stick to the tar.

There are many other recommendations in the literature, such as—

(*a*) Dusting the plants with soot or soot-and-lime when the leaves are wet with dew; or rolling; or driving sheep over the field when the leaves are damp, so that the dust sticks to them. The principle underlying these suggestions is that the beetle, being an epicure, is disgusted with the dirty food. Paraffin, 1 gallon to the acre, similarly disgusts the beetle.

(*b*) A dressing with a mixture of 1 bushel of finely powdered fresh gas-lime, 1 bushel quicklime, 6 lb. sulphur, 10 lb. soot. This suffices for two acres, and is to be applied to the plants when the dew is on them.

THE CEREAL AND OTHER CROPS OF SCOTLAND FOR 1899, AND METEOROLOGY OF THE YEAR RELATIVE THERETO.

THE CROPS.

The following comparison of the cereal and other crops of 1899 with those of the previous year has been prepared by the Secretary of the Society from answers to queries sent to leading agriculturists in different parts of the country.

The meteorology of the year has been furnished by Dr Alex. Buchan, Secretary of the Meteorological Society of Scotland.

The queries issued by the Secretary were in the following terms:—

1. What was the quantity, per imperial acre, and quality of grain and straw, as compared with last year, of the following crops? The quantity of each crop to be stated in bushels. What quantity of seed is generally sown per acre?—(1) Wheat, (2) Barley, (3) Oats.
2. Did the harvest begin at the usual time, or did it begin before or after the usual time? and if so, how long?
3. What was the quantity, per imperial acre, and quality of the hay crop, as compared with last year, both as regards ryegrass and clover respectively? The quantity to be stated in tons and cwts.
4. Was the meadow-hay crop more or less productive than last year?
5. What was the yield of the potato crop, per imperial acre, as compared with last year? The quantity to be stated in tons and cwts. Was there any disease? and if so, to what extent, and when did it commence? Were any new varieties planted, and with what result?
6. What was the weight of the turnip crop, per imperial acre, and the quality, as compared with last year? The weight of the turnip crop to be stated in tons and cwts. How did the crop braird? Was more than one sowing required? and why?
7. Were the crops injured by insects? State the kinds of insects. Was the damage greater or less than usual?
8. Were the crops injured by weeds? State the kinds of weeds. Was the damage greater or less than usual?
9. Were the pastures during the season of average growth and quality with last year?
10. How did stock thrive on them?

11. Have cattle and sheep been free from disease?
12. What was the quality of the clip of wool, and was it over or under the average?

From the answers received, the following notes and statistics have been compiled:—

EDINBURGHSHIRE. *Wheat.*—40 bushels; crop not so good as last year; quality about the same; straw less than last year; 3 bushels seed sown.

Barley.—48 bushels; quality good; straw less than last year; 3 bushels seed sown.

Oats.—48 bushels; quality fair, but not so well filled as last year; straw less; 4 bushels seed sown.

Harvest began 24th August, same time as last year. Weather very good.

Hay.—First crop less than last year; about 2 tons 10 cwt. Very broken weather for securing it. Second crop better than last year, and finely secured. *Meadow-hay*—Light crop; very well secured.

Potatoes.—Small crop; 4 to 6 tons. Some varieties a little diseased.

Turnips.—Very light crop; a great deal of second sowing, and much injured with fly and insects. *Mangold*—Less than last year, but a fair crop for the season.

Turnips very much damaged by insects; much greater than usual. Not much damage from weeds.

Live Stock.—Pastures scarcely so good as last year. Stock healthy and quite free from disease. Both cattle and sheep throve well. *Clip of wool*—About the average, but very low prices.

LINLITHGOWSHIRE. *Wheat.*—About the same in quantity and quality as last year; from 30 to 40 bushels; seed from 2½ to 3 bushels.

Barley.—Not near so good either in quantity or quality as last year; from 24 to 36 bushels; seed from 2½ to 3 bushels.

Oats.—Not near so good either in quantity or quality as last year; from 24 to 36 bushels; seed from 4 to 5 bushels.

Harvest began and ended about ten days before the usual time in the north part of the county, and about the usual time in the south.

Hay.—Not so good either in quantity or quality as last year; from 1 to 2 tons. *Meadow-hay*—Very little grown.

Potatoes.—Not nearly so good either in quantity or quality as last year; in many cases just about half a crop; from 3 to 6 tons.

Turnips.—A very poor crop; in some cases a failure; good deal of finger-and-toe. Second and even third sowings; did not braird well.

No injury by insects. Owing to the turnips not brairding well weeds got up, and in many cases did a good deal of injury.

Live Stock.—Pastures of average growth and quality. Stock throve fairly well. Cattle and sheep free from disease. *Clip of wool*—Average.

HADDINGTONSHIRE (Upper District). *Wheat.*—None grown.

Barley.—36 bushels; some of the grain prematurely ripened, and straw under average; 3 bushels sown.

Oats.—40 bushels; grain lighter than usual, and straw short; 4 bushels sown.

Harvest ten days earlier than usual, and all in stackyard in four weeks.

Hay.—Ryegrass a short crop, about 32 cwt., and not well secured. *Meadow-hay*—Short crop.

Potatoes.—Nearly 5 tons, about a ton less than last year; some disease in Good Hope potato.

Turnips.—About 14 tons of good quality, being a third less than last year. The crop brairded well; but first sowing destroyed by frost and fly.

First sowing and also second sowing much destroyed by turnip-fly. Weeds nothing much. Some fields had a large braird of "runches" or wild mustard.

Live Stock.—Pastures average, but very bare in June. Stock throve well. Cattle and sheep free from disease. *Clip of wool*—Average.

HADDINGTONSHIRE (Lower District). *Wheat.*—About 48 bushels; one-third less straw than last year; $3\frac{1}{2}$ bushels sown.

Barley.—40 to 44 bushels; about the same straw as last year; $2\frac{3}{4}$ bushels sown.

Oats.—44 bushels; rather more straw; 4 bushels sown.

Harvest began 15th August, or two days earlier than last year.

Hay.—1 ton 15 cwt., or rather less than last year; rather long in being cut, consequently there was a good deal of the seed lost and a great deal of it got weather; very little second crop. *Meadow-hay*—None grown.

Potatoes.—About 4 tons Maincrops; 6 to 8 tons Up-to-Dates, in which there was a good deal of disease. The earlier sorts were a small crop.

Turnips.—Yellows a very poor crop, 6 to 8 tons; swedes finished a fair crop, 10 to 15 tons; fair quality; a great deal of second sowing, and even third sowing. Mildewed very early in some parts, disappearing altogether in some cases.

A deal of damage done to the turnips by lice. No injury by weeds.

Live Stock.—Pastures fairly good. Stock did well on them. Cattle and sheep free from disease. *Clip of wool*—Average.

BERWICKSHIRE. *Wheat.*—36 bushels; quality much the same as last year.

Barley.—33 bushels; quality inferior in many cases, owing to unsuitable weather. Wettish seed-time, and grain ripened too suddenly.

Oats.—32 bushels. Remarks on barley applies even more strongly to oats; at least the sudden ripening damaged the yield much.

Harvest began at the usual time—the middle of August.

Hay.—25 cwt. Affected by variable weather. Quality poor where hay was cut late—after the wet weather had ceased. It was too ripe, and washed with the rain. *Meadow-hay*—Under average; little grown.

Potatoes.—5 tons. Many injured by ground being too wet at planting. A good deal of disease in the finer sorts.

Turnips.—14 tons; on heavy land a better crop than last year; braird was late in coming away, owing to long drought. On light land much resowing—crop therefore not so good.

Turnip-fly did damage to early braird. Yellow weeds not quite so bad as usual.

Live Stock.—Pastures injured by a cold wet spring, and then by the succeeding drought. Stock throve fairly well; lambs thinner in condition, and weaker ones suffered from bowel complaint. Cattle and sheep free from disease. *Clip of wool*—Average.

ROXBURGHSHIRE. *Wheat.*—About 32 bushels; small breadth grown.

Barley.—31 bushels.

Oats.—30 bushels; crop deficient.

Harvest began rather early, and generally quickly harvested.

Hay.—About $1\frac{3}{4}$ ton; quality rather under average. *Meadow-hay*—About the same as last year.

Potatoes.—About 4 tons marketable; considerably under that of last year; very little disease, mostly confined to Up-to-Date sorts.

Turnips.—About 14 tons, and very much below last year; fair quality; a good deal of second sowing.

Almost no injury by insects. Very little damage by weeds.

Live Stock.—Pastures not quite so full as last year. Stock did not thrive so well as last year. Cattle and sheep very healthy. *Clip of wool*—About an average.

SELKIRKSHIRE. *Wheat.*—None grown.

Barley.—30 bushels; rather less than last year; quality good as last year; not very much barley grown in the county; quality uneven; 3½ bushels sown.

Oats.—28 bushels; less than last year, say 2 bushels; quality good, both grain and fodder; 4½ bushels sown.

Harvest began a few days before the usual time.

Hay.—Sown grass lighter than last year, say 10 cwt. less. *Meadow-hay*—About the same as last year; crops varied very much, owing to the kind of land it was grown upon—dry land.

Potatoes.—Easily one-third less than last year, say 3 tons; no disease. No new varieties.

Turnips.—Great variety in the turnip crop this year; safely estimate them all over at one-third under average; quality average, say about 12 tons; crop brairded very bad. In some instances many sowings were required; fly, scorching heat, and drought.

Ordinary turnip-fly; more than usual. No injury by weeds.

Live Stock.—Pastures of average growth and quality. Stock throve well. Cattle and sheep quite free from disease; of course, ordinary casualties. *Clip of wool*—Under average, especially on the hills.

PEEBLESSHIRE. *Wheat.*—None.

Barley.—None.

Oats.—30 bushels; 5 bushels sown.

Harvest began at the usual time.

Hay.—1 ton 5 cwt.; clover scarce. *Meadow-hay*—Less.

Potatoes.—9 tons; no disease; no new varieties.

Turnips.—18 tons; quality good; brairded fairly well.

No insects. No weeds.

Live Stock. — Pastures scarce. Stock throve fairly well. Cattle and sheep free from disease. *Clip of wool*—Average.

DUMFRIESSHIRE (Annandale). *Wheat.*—None grown.

Barley.—Grown in very small quantities.

Oats.—The quantity and quality of straw would equal that of last year, but quantity of grain is estimated at from 2 to 5 bushels under last year's crop. Quality of grain is extra good, owing to dry harvest; average yield 37 bushels. Quantity of seed sown—broadcast, 4 bushels with seeds, 5 bushels with lea; drilled, 3 bushels with seeds, 5 bushels with lea.

Harvest about eight days earlier than usual time.

Hay.—Last year the yield would be 1½ ton, this year about a half less. There was very little clover in the hay crop this season; most farmers blame the wood-pigeon for destroying the young plants during the winter, but the cold spring and dry season no doubt had a prejudicial effect. *Meadow-hay*—This crop was good, and would equal last year's in quantity and quality.

Potatoes—Yield less than last year; average this season about 6½ tons. No disease until about the time the tubers were being lifted. Since lifting, disease has been causing great loss.

Turnips.—Weight of crop at least one-half less than last year; quality also under average, owing to crop not being properly matured when lifted.

Some farmers put their weight at 15 tons, others 10 tons; average about 12 tons. Crops brairded badly. In nearly every case the seed had to be resown. A great majority had to sow three times.

Crops other than turnips were not injured by insects, at least not to any extent. Turnips suffered from "fly," and swedes from a species, it was supposed, of aphis. Owing to dry summer, weeds were easily kept under.

Live Stock.—Pastures were very poor, especially so in the earlier part of the season. They improved in the autumn. Stock did not do well, more especially feeding cattle getting cake on grass. Cattle have been free from disease, but there has been the usual complaints of sheep dying on turnips from what is known as "red braxy"—aggravated this year by folding on unripe turnips. This disease is always more prevalent on what is known as black-topped land. *Clip of wool*—Quality was up to the average.

DUMFRIESSHIRE (Nithsdale). *Wheat.*—Not grown.

Barley.—Little grown.

Oats.—30 bushels of inferior grain; straw light on thin land, but good on deep good land; seed, 5 bushels.

Harvest began before usual by seven days.

Hay.—Ryegrass about half crop, of poor quality. *Meadow-hay*—Not so heavy as previous year, but about average.

Potatoes.—Comparative failure, about 50 per cent being diseased. First appearance about 1st of August.

Turnips.—Half a crop, say 10 tons, but very irregular, many fields being a failure; brairded badly, and in many cases three sowings required.

Turnip-fly very strong, eating turnip plant as it appeared above ground. All weeds abundant in turnip-fields, in many cases nothing else to be seen till late in summer.

Live Stock.—Pastures not of average growth and quality with last year, and unusually bare in autumn. Stock wanted condition. Cattle and sheep free from disease. *Clip of wool*—Fair average.

DUMFRIESSHIRE (Eskdale). *Wheat.*—None grown.

Barley.—Almost none grown.

Oats.—33 bushels. Generally 5 imperial bushels sown. Quality of grain could not be surpassed, being as hard and dry as old oats, due to the warm forcing weather for a few weeks before being cut, which continued until (with a very few exceptional cases) all was housed, consequently the straw was equally good as to quality as the grain.

Harvest about a week earlier than usual.

Hay.—1 ton 6 cwt.; nearly all well got, and generally good in quality. *Meadow-hay*—More productive than last year, probably to the extent of 5 cwt.; remarkably well got, even to late in autumn. The bent grass being quite green and succulent into September, when a great quantity was secured on the hills for sheep, consequently hill farmers as a rule have abundant supply to face a storm.

Potatoes.—7 tons; a larger crop than last year, probably by a ton; disease prevalent, commencing early in September. About 7 per cent, diseased less or more, according to variety. None quite free of disease. No new varieties planted.

Turnips.—About 11 tons; owing to wet cold rains in the early part of June the crop brairded badly, and a large area had to be resown, in many cases more than once, owing to the said cold unpropitious weather. Then the weather became too dry for a while, and prospects were miserable in the extreme; but nice rains coming down, the crop in August and September came away in a wonderful manner, resulting in a fair but less than medium crop, which stands little eating.

The black fly was very prevalent, and chiefly caused the unusual re-sowing; to an extent unprecedented. Crops not much injured by weeds, the weather being unusually favourable for their destruction. Charlock is the principal weed in this district, but hope the sprayer will prove to be a much-needed and effective remedy.

Live Stock.—Drought was prevalent through July, and pastures were burnt for a while, but came away fast after the rain began to fall, giving ample feed to stock, which throve well upon them. Stock throve well. Cattle and sheep more free from disease than usual. *Clip of wool*—Of medium quality and light in weight upon hill farms, owing to cold uncongenial weather in March and April.

KIRKCUDBRIGHTSHIRE. *Wheat.*—About average, 32 bushels; seed, 2½ to 3 bushels.

Barley.—34 bushels; average bulk of straw; seed, 3 to 4 bushels.

Oats.—36 bushels; straw fully an average; seed, 4 to 5 bushels. Crop irregular, some fields thin.

Harvest began about usual date in early districts, but about two weeks earlier than usual in late districts, there being very little difference between early and late districts.

Hay.—Under an average; quality fair; yield 20 to 25 cwt. *Meadow-hay*—Not quite equal to last year; yield 18 to 24 cwt.

Potatoes.—Much less than last year; 3 to 6 tons; much disease in some varieties; 30 to 50 per cent.

Turnips.—Very deficient. Swedes, one-third of a crop, 7 to 9 tons; yellows, barely two-thirds of average crop, 15 to 18 tons; brairded fairly, but died away. A large proportion (nearly half) of the crop resown; in some cases several sowings necessary.

Wireworm very prevalent, but most damage done by a fungus or mildew which caused swedes to lose their leaves. No injury by weeds.

Live Stock.—Pastures during summer of average growth, but deficient in autumn. Stock throve very fairly. Cattle and sheep free from disease. *Clip of wool*—Average in weight and quality.

WIGTOWNSHIRE. *Wheat.*—27 bushels; quality good; straw good quality; rather under average quantity; weight of straw, say 30 cwt.; seed sown, 2½ to 3 bushels, according to the state of the land when sown.

Barley.—31 bushels; quality good; straw good; rather more abundant than last year; seed sown, 3½ bushels.

Oats.—38 bushels; quality fair; good colour, but 1½ to 2 lb. per bushel lighter in weight; yield considerably less than last year; straw much more abundant than last year, and not so good quality. Warm weather before harvest ripened grain too quickly.

Harvest began about a week earlier.

Hay.—33 cwt.; quality very good. Got good weather to make and secure it. Say 1 to 2 cwt. less than last year. *Meadow-hay*—20 cwt.; very good quality. Got good weather to make and secure it. About 1 cwt. less quantity than last year.

Potatoes.—3¾ tons; quality good. Smaller in size than usual. Crop better than last year, but rather under the average.

Turnips.—12 tons; quality generally very bad; much diseased—finger-and-toe. Early sown looked well till July, when they stopped growing, and turned hard and a poor crop, and poor quality.

Turnip crop injured very much with wireworm, but no other crops were injured by insects or otherwise. No damage by weeds.

Live Stock.—Pastures during the season of average growth and quality with last year. Stock throve well. Cattle and sheep free from disease. *Clip of wool*—Rather under an average than otherwise.

AYRSHIRE. *Wheat.*—Almost none sown now.

Barley.—40 bushels; grain of a darker colour than usual on account of wet weather; seed, 3 bushels (drilled).

Oats.—43 bushels grain; quality under average; seed, 4 to 4½ bushels.

Harvest began about usual time.

Hay.—1 ton 14 cwt; much the same as last year, which was, however, less than average.

Potatoes.—Yield about 6 tons; almost no disease. A few new varieties planted, with varying results.

Turnips.—About 18 tons; very much affected with finger-and-toe; crop brairded badly, and larger breadths had to be resown.

The cabbage crop was in nearly every case damaged, and in some cases totally destroyed, by a small wireworm (quite a new trouble) attacking the roots after the crop was nearly half matured. Not more than usual injury by weeds.

Live Stock.—Pastures much the same. The month of May being cold and wet, stock did not do well till later in the season than usual. *Clip of wool*—About an average in quantity and quality.

BUTE. *Wheat.*—40 bushels; middling quality; straw bulky; 3½ bushels of seed sown.

Barley.—3½ bushels sown; grain, 68 bushels; fairly well got; straw bulky.

Oats.—5 bushels sown; 36 bushels grain; fairly well got; straw about an average.

Harvest began—a few lots of barley—on August 20th; September 1, general.

Hay.—About 2 tons; under the average; well got. *Meadow-hay*—Little here.

Potatoes.—Early potatoes commenced to be lifted June 20; crop under an average; about 5 tons. Late potatoes under average; about 6 tons. A little disease; the usual varieties planted.

Turnips.—Under average; from 15 to 20 tons; no resowing; crop brairded well.

No injury by insects or weeds.

Live Stock.—Grass above an average. Stock throve well. Cattle and sheep free from disease. *Clip of wool*—About an average in weight and quality.

ARRAN. *Oats.*—A fair average crop; straw not so good in quality, yielding about 32 bushels, but rather lighter per bushel; seed sown, about 6 bushels.

Harvest began about the same time as last year.

Hay.—Short crops, and not so good quality; yielding about 20 cwt. *Meadow-hay*—Average crop

Potatoes.—Crop short of average; quality fair; yielding from 4 to 5 tons.

Turnips.—About 10 tons; not more than half a crop; a good deal of finger-and-toe.

Not more than usual injury by insects. Crops being rather under average, more weeds appeared.

Live Stock.—Pastures much about the same. Stock throve fairly well. Cattle very healthy, foot-rot being very bad in autumn among packed ewes. *Clip of wool*—Light in weight; quality barely as good.

LANARKSHIRE (Upper Ward). *Wheat.*—None grown.

Barley.—None grown.

Oats.—About 30 to 35 bushels; quantity about the same as last year, but quality of grain inferior; 5 to 6 bushels sown.

Harvest began at the usual time, in the beginning of September.

Hay.—The quantity and quality were good, yielding about 2½ tons, being about the same as last year. Aftermath deficient on account of dry weather. *Meadow-hay*—Average crop, about the same as last.

Potatoes.—Yield from 4 or 6 tons; about a fourth less than last year; large amount of disease, particularly in early varieties. Up-to-Dates especially were extensively diseased; it commenced in middle of August. In addition to the prevailing crops of Suttons, Up-to-Dates, and Maincrops, a few Kidneys and British Queens were planted, with fairly good results. The Maincrop is the best quality of potato, as well as the best disease-resisting, in this district; but it is a small cropper, and as the difference in price between it and the other varieties is only a few shillings, it is as a rule not so profitable a crop, and in consequence fewer are being planted every year.

Turnips.—Inferior crop, yielding from 15 to 20 tons, a fourth less than last year; quality also inferior; brairded badly, and had mostly to be sown a second time, the first sowing being largely taken by the turnip-fly.

The corn crop raised from "the lea" was in some places injured by grub, and consequently was not an equal braird; and the first sowing of turnips was extensively taken by the fly after having brairded, rendering resowing necessary. Not more than usual weeds, and easily dealt with.

Live Stock.—Pastures deficient in early part of season, but on the whole of an average growth. Stock throve well. Cattle and sheep free from disease. *Clip of wool*—Variable in different districts, but on the whole of average quality and quantity.

LANARKSHIRE (Middle Ward). *Wheat.*—40 bushels; quality of grain and straw good; straw less than previous year; seed sown, 3½ bushels.

Barley.—Very little grown.

Oats.—Deficient crop in both grain and straw; on the best cultivated farms yield 40 bushels, others impossible to estimate. Great complaints about the short crop.

Harvest began same week as last. Fine weather first four weeks; finish of harvest very wet.

Hay.—Same as last year. Yield (ryegrass), 30 cwt. to 2 tons; Timothy, 2 to 3 tons; finely got, and good quality. *Meadow-hay*—Average crop, and well got.

Potatoes—6 to 8 tons—3 tons less than last year; hardly any disease. Varieties planted: Sutton's Abundance, Up-to-Dates, and Gartons. No new varieties.

Turnips.—General failure, owing to long drought; did not braird; and were resown several time in some districts. Fly bothersome. Yield, hardly half a crop.

Turnip-fly and grubworm principal troubles, but no greater damage than former years. Weeds not troublesome, and easily killed.

Live Stock.—Pastures fair — same as previous year. Scarce during "drought," but abundant afterwards. Stock throve fairly well, especially towards end of season. Cattle and sheep free from disease. *Clip of wool*—Average.

LANARKSHIRE (Lower Ward). *Wheat.*—36 bushels; not well filled, but good straw; 4 bushels sown.

Barley.—None grown.

Oats.—30 bushels; grain very poor; fair straw—in a great many cases it is very short; 5 bushels sown.

Harvest was just about the usual time.

Hay.—Smaller crop than last year; mostly well got; and on an average 1½ tons. *Meadow-hay*—Just about the same as last year.

Potatoes.—8 tons; few diseased, except some kinds; few new kinds planted.

Turnips.—12 tons; and they brairded very irregular; some twice sown. Not much injury by insects.

Live Stock.—Pasture very much the same as former years. Stock throve very well. Cattle and sheep free from disease.

RENFREWSHIRE (Lower Ward). There is not much of a new character to report as to the crop of 1899. The season was similar to the preceding one. There were not good prospects in the early months, indeed plants of all descriptions were slow in making growth, and many varieties never recovered, one cause being the saturated condition of the land, followed by dry ungenial weather, which had the effect of rendering the soil unfavourable for germinating requirements. The crops which had been from this cause retarded were forced on by hot weather during the months of July and August, the latter being unusually hot. The result was that grain crops did not fill well, and were consequently not up to average. Hay crops were light, and clover very deficient. Root crops were inferior, being much troubled with fly, and consequently resowing was necessary, and until far on in the season reached no size, and finger-and-toe was prevalent. The only point in favour of the root crop was the open winter, which helped in a measure to remedy the evils. The potato crop was better than last year, the season being more favourable for it, and the yield in some cases 1½ to 2 tons better. Disease started in September. Sutton's Abundance did not stand it well. Up-to-Date and Maincrops withstood it much better. The rainfall during the year was 62·10 against 68·45 in the previous year.

ARGYLLSHIRE (Lochgilphead District). *Wheat.*—None grown.

Barley.—None grown.

Oats.—Quality about equal to last year, but both straw and grain badly damaged with continuous wet weather; yield about 30 bushels; 6 bushels sown.

Harvest began at the usual time, 25th August.

Hay.—Ryegrass similar to last year. Clover much better. About 2 tons. *Meadow-hay*—A good average crop.

Potatoes.—Not so good as last year; about 6 tons; very badly diseased; disease commenced about the middle of September.

Turnips.—Better than last year; about 25 tons; brairded very well; no second sowing.

No injury by insects or by weeds.

Live Stock.—Pastures during the season of average growth and quality with last year. Stock throve very well. Cattle and sheep free from disease. *Clip of wool*—Average quality good; price very bad.

ARGYLLSHIRE (District of Kintyre). *Wheat.*—None.

Barley.—A fair average crop; quality good; average about 5 quarters; seed sown, about 4 bushels.

Oats.—Average crop; straw rather deficient on poor land; would average about 6 quarters; seed sown, about 5 bushels.

Harvest began about one week earlier than usual.

Hay.—Crop lighter than last year; average about 2½ tons. *Meadow-hay* was lighter than last year.

Potatoes.—A fair average crop; yield on an average about 7 or 8 tons; a little disease in the early planted potatoes. No new varieties were planted that I am aware of.

Turnips.—Average weight about 17 or 18 tons; quality good. Generally the crop brairded well, and very little second sowing was required.

A few fields of oats were thinned by the grub. Fly did very little damage to a few fields of turnips. Very little injury by weeds.

Live Stock.—Pastures were very good all summer. Stock throve very well. No disease. *Clip of wool*—Fair average quality, and about the usual quantity.

ARGYLLSHIRE (Islands of Islay, Jura, and Colonsay). *Wheat.*—None grown.

Barley.—Almost none grown.

Oats.—Straw and grain very similar to last year. Stormy and wet weather caused a very prolonged harvest. 6 bushels sown.

Harvest was about a fortnight later than usual.

Hay.—Ryegrass was lighter than usual, but clover was a good average. *Meadow-hay* was a good average crop.

Potatoes.—The yield of the potato crop was rather under an average. Disease commenced early in July, and in many places half of the crop was bad.

Turnips.—Crop all over is considerably below an average, although in some places it was very good. Early sown turnips, as a rule, did well; but the late sown swedes failed to braird, or were eaten with fly, and yellows had to be substituted. Drought after sowing was the chief cause of failure.

With the exception of the turnip-fly, the damage done by insects was not greater than usual. The damage done by weeds not greater than usual.

Live Stock.—Pastures of average growth and quality with last year. Stock was in rather poorer condition than usual owing to excessively wet winter and spring, but during summer they throve fairly well. Disease among cattle has not been more prevalent than usual. Sheep on high ground were healthy, but many deaths occurred on low-lying wet land. *Clip of wool*—Rather under an average in weight.

ARGYLLSHIRE (Inveraray District). *Wheat.*—None grown in this district.

Barley.—Scarcely any grown.

Oats.—Fair average crop; not generally well saved, except where corn-drier in use; yield, about 30 to 32 bushels.

Harvest began much about usual time. At one time it was expected it would be late, but ripened fast at last.

Hay.—There are very few farms in this district where clover thrive; but season grasses of all kinds cut somewhat early, the weather being suitable; weight scarcely average; quality good. *Meadow-hay*—Not so heavy as last year; about 30 to 36 cwt., and on dry land less; moderately well saved.

Potatoes.—Not so heavy nor so good quality as usual. In many cases soft; average perhaps 5 to 7 tons. Some of the old disease before being dug, also some soft-rot.

Turnips.—In a few cases turnips had to be resown, and were generally late of coming on, but latterly throve well, and ranged from 10 to 25 tons. Finger-and-toe in a few cases.

No perceivable damage by insects. Not much damage by weeds; less than usual; mustard, dockins, thistles, and flowering-nettle.

Live Stock.—Pastures much about the same as last year. Stock throve fairly well. Cattle and sheep free from disease. *Clip of wool*—About an average.

DUMBARTONSHIRE. *Wheat.*—About 32 bushels; quality of grain and straw quite as good as last year; 2½ to 3 bushels sown.

Barley.—Very little grown. A light crop.

Oats.—In the Highland district about 28 bushels; quality of straw fair. In the lower districts of the county about 35 bushels; not so good as last year in quality; seed, 4 bushels.

Harvest about usual time, after a cold wet seed-time.

Ryegrass-hay from 1 ton 5 cwt. to 1 ton 8 cwt.; quality not so good as last year. *Meadow-hay*—An average crop; quality good.

Potatoes.—On best land 6½ tons; less than last year. Little disease commenced end of August. One new variety called "British Lion," good cropper; good quality; no disease when lifted.

Turnips.—From 10 to 18 tons; very little resowing.

There was a slight trace in some districts of grub in the oats, also of fly in the turnips, but the damage was slight. Not much injury by weeds.

Live Stock.—Pastures very deficient until the end of May, but good after that. Stock did very well. Cattle and sheep free from disease. *Clip of wool*—Fair; not so good as last year.

STIRLINGSHIRE (Western District). *Wheat.*—None sown in this district.

Barley.—Little grown; average yield 33 bushels; well secured; seed about 4 bushels.

Oats.—The principal grain crop grown in the district. The yield was not up to the average of years. The cold frosty weather in May and part of June checked the growth. Up to about 1st July there was every appearance of a late harvest, but about that time we had fine rain with warm forcing weather, which pushed the crops fast to the reaper and binder, and in some cases before the ears were properly filled. Average yield 33 bushels; fine sample of straw and grain; well secured.

Harvest commenced a few days earlier than last year.

Ryegrass-hay was a light crop; average 1 ton 7 cwt. In almost every case very little clover, generally attributed to cold frost in May. *Meadow-hay*—A light crop, but well secured in fine condition.

Potatoes.—A fair crop; from 6 to 9 tons; fine quality; very little disease. Sutton's Abundance and Maincrop chiefly grown. No new varieties planted.

Turnips.—Generally a light crop. The weather in May and June was the worst we have experienced for many years. Frost at night and withering weather through the day checked the growth; and the fly was numerous, and hurt the young tender plants, which caused resowing at least over two-thirds of turnip brake. Very few weeds.

Live Stock.—Pasture was very poor in growth and quality in the early part of the season. With the fine forcing weather in July and August it improved. Stock throve well. Cattle and sheep free from disease. *Clip of wool*—Light, but of average quality.

STIRLINGSHIRE (Eastern District). *Wheat.*—3½ bushels sown; produce, 40 bushels. Quality of straw and grain much inferior to last year, and yield about a third less; small acreage sown.

Barley.—3 bushels sown; 30 bushels produce carse; 28 bushels dry field. Quality fair on dry field, but on carse land very much behind, as it was a very wet spring, which made seed-time very late. Same as last.

Oats.—5 bushels sown; produce, 30 bushels. Straw and grain very short. The worst crop for some years.

Harvest.—It was a good harvest, but it was earlier than it should have been, grain having ripened far too quick.

Hay.—Carse, 2 tons; dry field, 30 cwt. Well got. *Meadow-hay*—Short crop, but well secured.

Potatoes.—4½ bushels yield; not much disease.

Turnips.—The worst crop in my remembrance; brairded badly; too much second sowing.

Injury by insects greater than usual, especially turnips.

Live Stock.—Pastures, bad spring but good back part of year. Stock throve just middling No disease. *Clip of wool*—Very much under previous years.

Clackmannanshire. *Wheat.*—50 bushels; 35 cwt. straw; very good crop; seed sown, 3 bushels.

Barley.—40 bushels; 25 cwt. straw; fair average crop; seed sown, 3 bushels.

Oats.—42 bushels; straw, 20 cwt.; crop under average, and grain very light weight; seed sown, 4½ bushels.

Harvest commenced about the usual time—last week of August.

Hay.—2 tons ryegrass. A good lot of Timothy grown in the county; it would average 2 tons 15 cwt.; very good quality. *Meadow-hay*—None.

Potatoes.—8 tons; good crop; no new variety; free from disease when lifted, but going badly in pits.

Turnips.—16 tons; very much below average. A great deal of second sowing required, owing to the drought early in the season.

No damage by insects. Very little damage by weeds.

Live Stock.—Pastures were very good. Stock throve very well, and were free from disease.

Fifeshire (Eastern District). *Wheat.*—34 bushels; one-fourth less than last year, owing to the cold wet spring and dry summer; quality not so good; straw, 30 cwt.; seed sown, 4 bushels.

Barley.—36 bushels; one-third less than last year, owing to above causes; quality not so good; seed sown, 4 bushels; straw, 25 cwt.

Oats.—38 bushels; one-fourth less than last year, owing to dry summer; quality not so good; straw, 22½ cwt.; seed sown, 4 bushels.

Harvest began about the usual time.

Hay.—Crop, 35 cwt.; quality and quantity under last year. *Meadow-hay*—Very little grown in the district.

Potatoes.—3 tons 5 cwt.; one-half less than last year. Bruce and Up-to-Date—nearly one third diseased. A few varieties planted, but no great results obtained.

Turnips.—Swedes, 16 tons; yellows, 10 tons; nearly one-half short of last year's crop; brairded very badly; and a large quantity had to be resown owing to dry weather.

No damage by insects or by weeds.

Live Stock.—Pastures during the season not of average growth and quality with last year. Stock did not thrive so well as last year. Cattle and sheep free from disease. *Clip of wool*—Average.

Fifeshire (Middle District). *Wheat.*—28 bushels of grain; quality fairly good. There was very little more than a ton of straw. It went to little bulk in stackyard, but was well harvested. From 3 to 3½ bushels sown.

Barley.—30 bushels of grain of good quality. There was a fair bulk of straw, but the yield has been very disappointing. Weight of straw about 23 cwt. From 3½ to 4 bushels sown.

Oats.—In some parts of the district this crop was of average bulk, but generally it was under average. The earlier sown crops were of least bulk, the later ones considerably heavier. The yield will be about 36 bushels; weight of straw, 25 cwt.; seed sown, 4½ to 5 bushels.

Harvest began about the beginning of July. All the crops—cereals—

had the appearance of being late in coming to maturity; but the heat, drought, and forcing weather of the end of July and August whitened and ripened the crops, so that the harvest was begun in August, and was general in the first week of September.

Hay.—This crop was all over under an average one. There was a great deficiency of clover. About 25 cwt. would be the average crop. *Meadow-hay*—Less productive than last year. There would not be more than 18 cwt. to a ton.

Potatoes.—The yield of this crop was very much less than the crop of the previous year, and there was a much larger proportion of diseased tubers. The disease made its appearance early in September; proportion of disease from a fourth to a half of crop. Weight of crop, 4½ tons. A few acres planted of British Queen and Scottish Triumph.

Turnips.—This crop is considerably under an average one; indeed it may be said that it is the lightest crop of turnips for the past ten years. The weight will not be more than 13 tons, taking swedes and yellows together. The severe drought in early summer made repeated sowings imperative, and the crop all through was very late in getting a start.

Turnip crop considerably injured by wireworm; much greater than usual. Not more than usual injury by weeds.

Live Stock.—Pastures were under the average growth. Stock throve fairly well. Cattle and sheep free from disease, with the exception of some cases of anthrax. *Clip of wool*—Fair average quality and weight.

Fifeshire (Western District). *Wheat.*—32 bushels; both good quality; 4 bushels of seed sown.

Barley.—30 bushels; quality of grain roughish; quality of straw fine; 3 to 3½ bushels of seed sown.

Oats.—30 to 40 bushels; quality of grain exceedingly poor; quality of straw rather infirm; 4 to 6 bushels of seed sown.

Harvest began about the usual time, but the whole grain crops were prematurely ripened.

Hay.—1 ton; quality fine; a very poor crop generally. *Meadow-hay*—Less productive.

Potatoes.—About half the yield of last year, with the exception of a few favoured fields; say 4 to 5 tons. Little disease in Maincrops, but very prevalent in all the softer grown varieties, such as Abundance, Up-to-Date, &c.

Turnips.—A miserable crop; generally about half the crop of last year. Never was there more resowing, and the later sowings came to nothing.

Little damage from insects or from weeds on properly cultivated lands.

Live Stock.—The severe drought in August completely burned up all pastures, and they are only recovering from it now. Stock throve fairly well. Cattle and sheep free from disease. *Clip of wool*—Rather under average.

Perthshire (South-Western District). *Wheat.*—Average yield, 30 to 40 bushels; good quality; yield of straw just under an average. A larger area of wheat sown than in former years; seed sown, about 3½ bushels.

Barley.—On dryfield land, 30 to 34 bushels; better quality than last year; about same area sown; straw short; seed, 3 to 3½ bushels.

Oats.—Yield, 38 bushels; indifferent sample; fully an average bulk of straw of good quality; seed, 4½ to 5 bushels.

Harvest.—On an average about a week later than 1898.

Hay.—Crop much lighter than in 1898; good quality and well got, but no second crop. Average crop of carse land, 35 cwt.; on dryfield land, 30 cwt.; but in many cases much under the latter figure. *Meadow-hay*—Crop much lighter than in 1808; quality under average.

Potatoes.—Poor crop; average yield, 5 to 6 tons; disease not so prevalent as in 1898; quality good. No new varieties planted.

Turnips.—About 14 tons; quality indifferent; brairded badly, and in some cases where the braird came away all right, the plants were burned up just as they came into the rough leaf. Quite two-thirds of the area in this district were resown; in some cases a third sowing took place. Turnip-fly was very prevalent; but dry frosty nights and scorching days were the cause of the failure of the braird. No such failure of the braird has been experienced for many years. Weeds were not so plentiful as in former years; the work of resowing probably kept them in check.

Live Stock.—Pastures suffered from want of moisture, but there was a fair autumn growth. Stock throve fairly well, but generally left nothing for summering; in fact, in some cases, they lost money. No disease among stock. *Clip of wool*—Barely an average.

PERTHSHIRE (Coupar-Angus District). *Wheat.*—The average yield in this district will be under that of last year, especially on light soils; but on good, deep, strong land there is a full average crop of good quality, both in straw and grain, yielding from 30 to 36 bushels; seed generally sown, from 3 to 3½ bushels.

Barley.—This crop is also under the average of last year, both as to quantity and quality, caused by the long-continued drought, and in many cases by the ravages of wireworm; yield from 30 to 40 bushels; seed sown, from 3 to 3½ bushels.

Oats.—This crop also much under average of last year for want of rain in time, and being prematurely ripened by the long-continued hot and dry weather; yield, from 32 to 40 bushels; seed, from 4 to 5 bushels.

Harvest began about the last week of August—the usual time in this quarter,—and the weather being very favourable, the crops were all secured in excellent order.

Hay.—This crop must also be put down as under the average of last year as to quantity, and the quality in many cases very much damaged by rain after being cut; yield, from 1½ to 2 tons. *Meadow-hay*—Very little made in this district.

Potatoes.—On the deep heavier soils a fair average crop both as to quantity and quality, but on the lighter soils rather inferior as to quantity—the tubers, owing to the long-continued drought, being rather small. Maincrops comparatively free from disease, but Sutton's Abundance and Up-to-Date varieties much diseased; average yield, from 5 to 8 tons.

Turnips.—This crop has been very disappointing, and much under an average of years. The crop brairded badly, and after it did braird was much destroyed by fly and other insects, necessitating in many cases a second and even a third sowing; and for want of rain at the proper time the crop generally is the poorest we have had for many years, yielding only from 12 to 20 tons.

The damage by insects this year was very much greater than usual. On well-managed farms there has been no injury to the crops by weeds.

Live Stock.—The pastures, where not burned up with the long-continued dry weather, were of average quality and growth with last year. Stock of all kinds did well on them. Cattle and sheep have been very free from disease of any kind. The *clip of wool* was a good average both as to quantity and quality.

PERTHSHIRE (Strathearn District). *Wheat.*—Very little grown; a fair crop; 32 to 40 bushels; 3 to 4 bushels sown.

Barley.—A fair average crop; 38 to 48 bushels; well coloured.

Oats.—An average crop; 35 to 45 bushels; 4 to 5 bushels sown. Red-

land corn under an average both in corn and straw, and grain not well filled in consequence of premature ripening; turning out deficient on threshing-floor in quantity and quality.

Harvest commenced early in August, and in most cases finished by the end of the first week of September.

Hay.—Crop light on the whole, but well secured; average, 1 to 2 tons. Clover not so good as in previous years. *Meadow-hay*—Light crop; less than last year, but secured in good condition.

Potatoes.—Crop a fair average one—6 to 7 tons—and pretty free of disease. Maincrops and Abundance were the principal kinds grown.

Turnips.—A poor crop; about half of last year; a good deal of second and third sowing; average, 10 to 15 tons; quality, especially yellows, rather deficient. Weather at time of sowing, and for a considerable time afterwards, the worst remembered for many years, swedes in many cases never coming to the hoe.

Grain crops suffered to a slight degree by insects, but turnips suffered to a large extent from grub and wireworm—damage in both cases being a great deal more than last year. A great deal of injury by weeds, especially charlock, in oats. Damage much more than last year.

Live Stock.—Pastures suffered a good deal from drought, except on well-farmed, heavy land; but in consequence of favourable weather improved considerably in the end of the season. Stock throve wonderfully well, except where pasture was much burned up. Cattle and sheep have been free of disease. *Clip of wool*—A fair average in quantity and quality.

PERTHSHIRE (Highland District). *Wheat.*—None sown.

Barley.—29 bushels; weight, 52 lb.; straw about same as last year; good on heavy soil, but not so on light land; 4 bushels sown.

Oats.—Lea, 40 bushels, and 41 lb. in weight. Clean land about the same. The straw all over was good and bulky. The oat crop was the best of any this year.

Harvest began about a fortnight earlier than last year, and the crop was well secured.

Hay.—20 cwt. The quality about the same as last year in respect to clover and ryegrass. The quality was good, and well secured. The aftermath was not so good as usual. *Meadow-hay*—About the same as last year in quantity. The quality was good, and well got.

Potatoes.—Less than last year; about 4½ tons. There was no disease. Up-to-Dates were the best crop, but not of good keeping quality.

Turnips.—The crop was not so good as last year, being only about 15 tons. There was a good deal of second sowing, and in several cases a third. The crop did not do well to begin with, but came on very well towards the end of the season.

The crops suffered through fly and frosty nights. There were few weeds.

Live Stock.—Pastures were not good all season, and did not compare favourably with last year. Stock grew well, but did not fatten. Both cattle and sheep were free from disease. *Clip of wool*—The quality was good, but not so bulky as last year.

FORFARSHIRE (Western District). *Wheat.*—Very little wheat grown; 36 bushels; quality of both grain and straw good.

Barley.—40 bushels; quality of both grain and straw good.

Oats.—48 bushels; quality of both grain and straw good, having had a splendid harvest, which lasted only a short time—one of the best harvests I ever remember. The weather was so good for drying all the time, I did not hear of any hot stacks in this immediate neighbourhood.

Harvest began same time to a day as last year, but they have both been early harvests, as well as good ones.

Hay.—In comparing the two crops, I think the quantity would be 5 cwt. more, and most of the hay was got well, so that the quality would also be good. I think 2 tons would be about the average.

Potatoes.—This is a very variable crop this year, and will range from 5 to 15 tons as far as my information goes. Not much disease before lifting-time, but I hear some are going wrong in the pits, especially Up-to-Date in some places. Not many new varieties planted that I am aware of—that is, in the fields I mean.

Turnips.—The turnip crop is, as a rule, a light one. I believe 18 tons will be a good average. The seed braird, I think, was of the worst. Some I never saw braird at all. Most people had to sow twice, and some three and four times, but the open fall of the year has given decent crops to what would otherwise have been a failure.

I do not think the crops suffered much from insects with the exception of the turnips, which, when bit with the fly, the cold nights and hot sun just withered them up, and they disappeared at once. Crops in this part did not suffer injury from weeds.

Live Stock.—Pastures would be a good average until the beginning of August, when they got dried up a good deal. Stock has done well, and has been free from disease, although an occasional one might drop. *Clip of wool*—A full average one.

Forfarshire (Eastern District). *Wheat.*—40 bushels of good quality, and well harvested; straw under an average crop, being thin on ground; 4 bushels sown.

Barley.—40 to 44 bushels of good quality and weight; straw about an average; 4 bushels sown.

Oats.—40 to 45 bushels; fair quality; straw under average, but saved in good condition; 4 to 6 bushels sown.

Harvest began 21st August as against 22nd August 1898. Weather good and crops saved, mostly in excellent condition.

Hay.—Fair crop; about 4 tons; good mixed quality, but weather bad for saving. *Meadow-hay*—None in district.

Potatoes.—Much under last year's crop; average from 6 to 8 tons; quality good; some disease in various kinds of tubers.

Turnips.—About same as last year, but very various; 18 to 25 tons; have as yet stood winter well.

No insects. Fairly free from weeds.

Live Stock.—Pastures fair, and stock throve well. Cattle and sheep free from disease. *Clip of wool*—Average, but lowest prices for some years.

Aberdeenshire (Buchan District). *Wheat.*—Not grown in this district.

Barley.—Was only a fair crop; from 36 to 42 bushels, and not so heavy as last year; quantity sown, from 3 to 5 bushels.

Oats.—About an average crop, and where it was about ready before the unfortunate gale in the beginning of September, is fully an average out-turn, while that not ready at the time of the gale is not so good, being light. Straw not good, being much twisted and laid, and is not nearly so good all over as last year, having stood in stook somewhat long, and being subjected to much rain, yet the grain was not damaged. Weight of grain, from 40 to 42 lb.; quantity sown, about 6 bushels; out-turn, 38 bushels, and in many cases much more.

Harvest was commenced about 1st September. The weather was showery and unsettled throughout.

Hay.—The crop was about an average, and on the whole was secured in good order. *Meadow-hay*—Not much cultivated in this district.

Potatoes.—The yield this year was generally fair, and the quality of the tubers splendid. There was no disease in the fields in this district.

Turnips.—The yield this year is very irregular, and the extent of swedes is comparatively small owing to having to resow two or three times. Swedes, from 10 to 15 tons; yellows, from 12 to 18 tons. The yellows are a better crop generally than the swedes, but neither bulked largely owing to stiffness in coming away at first.

Considerable damage done, especially to swedes, by insects. Weeds fully more plentiful than in most seasons.

Live Stock.—The pastures during the first part of the season were deficient owing to the cold wet weather, and many were bare of grass at first, but later on there was plenty of grass for stock. The stock did not do so well at first, but ultimately did much better when the weather improved. Cattle and sheep were free from disease. *Clip of wool*—About an average; prices still keep very low.

ABERDEENSHIRE (Formartine District). *Wheat*.—None grown.

Barley.—Last year 37 bushels; this year 37 bushels; straw about the same as last year; seed sown, 4 to 4½ bushels. The bushel weight is about 56 lb., or 2 lb. under last year. The quality of grain and straw is good, although not equal to that of last year's crop.

Oats.—Last year 42 bushels; this year 39 bushels; straw 10 per cent more than last year; seed sown, 5½ bushels, but on high-lying land 6½ bushels; quality of grain and straw poor, owing to winds and wet harvest weather. On many fields about 2 quarters were lost from these causes.

Harvest began about the usual time, and was protracted. It blew a gale or rained almost every day.

Hay.—"Seeds"—*i.e.*, ryegrass and clover mixed—are cut for hay, and yielded last year 30 cwt.; this year 32 cwt.; quality good. *Meadow-hay*—Practically none grown here.

Potatoes.—Last year 7 tons; this year 4½ tons of only moderate quality, but fairly free of disease.

Turnips.—Last year 15 tons. It is difficult to estimate this year's crop. Some good fields are to be seen, others are almost a total failure. As a whole the crop is bad; possibly the average might not exceed 11 tons. The crop brairded bad, and had to be sown twice over a large breadth—some of it three times.

Severe damage from turnip-fly, but frosty nights did most harm. Couch-grass and knot-grass hold their own, and do the usual damage.

Live Stock.—Pastures were good—fully better than last year. Live stock throve well. Cattle and sheep free from disease.

ABERDEENSHIRE (Garioch District). *Wheat*.—No wheat sown.

Barley.—Barley looked as well when growing as last year, but the yield would be 4 bushels less; 4 quarters would be about the quantity. The weight is good; 56 lb. and even 57 lb. are not uncommon. The quantity used for seed is 4⅛ bushels.

Oats.—Oats same as barley; looked well when growing, but the yield would be 4 bushels short of last year; 4⅝ quarters would be about an average. The crop was well harvested, and got into the yard in good order. Quantity for seed 6 bushels.

Harvest was begun with the barley about the 18th of August, and oats on 22nd, which was earlier than last year about a week.

Hay.—The hay crop was not so good as last year. The drought was long in June and July, which lessened it, but it was well mixed with rye-grass and clover. The quantity would be no more than 1 ton. There is no *meadow-hay*.

Potatoes.—The potato crop was also under that of last year, and a very unusual quantity of small ones. They are keeping well in the pits. There was no disease of any consequence, and no new varieties planted.

Turnips.—This season is the most remarkable for the growth of turnips yet experienced. The swedish variety were sown at the usual time, but frost occurred when coming through, which blighted them; and there are few farms which have any swedish green top. Yellow was then sown, sometimes twice and thrice before success was secured. Although throughout the greater part of Scotland the turnips are poor, in this district they have improved wonderfully, and are now a fair crop, weighing 17 to 20 tons.

Frost was the principal damage to the turnip crop. The crops suffered no injury from weeds.

Live Stock.—The pastures were long in being fit for cattle, longer than last year, but turned out well; and the cattle throve well and kept free of disease; occasionally a case of anthrax. *Clip of wool*—Similar to that of last year.

ABERDEENSHIRE (Strathbogie District). *Barley.*—Early in the season barley gave promise of being a good crop, but about the middle of August a very severe gale of wind was experienced, and did immense damage by shaking the grain and loosening the straw on the root, whereby the latter died away and prevented proper filling of the grain. About 34 bushels of grain may be given as an average, and the weight may be stated about 56 lb.

Oats also suffered severely from the gale, and on exposed fields heavy losses were sustained. As oats are grown on poorer land, the average quantity would be somewhat less than the record for barley. The general weight may be stated at 41 lb., but there are many parcels, of course, considerably under that weight.

Harvest began about the usual time, but owing to the broken-down state of the crops reaping was a tedious process, and difficulty was experienced in getting binders to work satisfactorily.

Hay.—The quantity of the hay crop was under the return of the previous year. The weather being good during the time it was being made, the quality is fair.

Potatoes.—The quantity of potatoes was unsatisfactory. The tubers were small in the run, and rather few of them at the stem. There was no disease of any kind. The old Champion, once a great favourite, is being replaced by newer varieties, such as Maincrops and Up-to-Dates.

Turnips.—The turnip crop has not done well. Great difficulty was experienced in getting the plants forward to the hoe, and a large extent had to be resown, there being scarcely any swedes, braird having gone off by fly and the effects of frost. Where resown the crop is generally light, and much care is being exercised in the quantity supplied to cattle. Roots will be very scarce for sheep in spring, and prices consequently high.

Live Stock.—Pastures generally did not do nearly so well as the previous season. Stock throve fairly well, but left an unsatisfactory return for grass. There has not been any disease among either cattle or sheep. *Clip of wool*—The quality was satisfactory, and the weight average.

BANFFSHIRE (Lower District). *Wheat.*—Scarcely any sown.

Barley.—Large breadth sown as usual, which gave a fair average crop, both of grain and straw, the former of good quality, unless a small quantity damaged in colour by standing too long in stook; quantity from 4½ to 5½ quarters; 56 to 58 lb. per bushel; seed sown about 4 bushels.

Oats.—Good average crop, and turning out, on being threshed, much better than expectation, both as to quantity and weight, the latter up

to 45 lb., and quantity from 4 to 6 bushels; seed sown from 5 to 6 bushels.

Harvest began about a fortnight earlier than last year, owing to the exceptionally hot sunny weather during July and the early part of August.

Hay.—Under an average crop; quality good, well mixed; quantity about 25 cwt. Scarcely any *meadow-hay*.

Potatoes.—The yield was rather under an average crop; from 3 to 5 tons; quality excellent, and very little disease of any kind prevalent.

Turnips.—Greatly under an average crop; from 10 to 20 tons; much injured by finger-and-toe; brairded badly; second and even third sowings very common, being eaten off by insects.

Little or no damage, apart from the early turnip plants. Crops not injured by weeds to any extent.

Live Stock.—Pastures quite an average with last year. Stock throve well. Cattle and sheep free from disease. *Clip of wool*—Fair average.

MORAYSHIRE. *Wheat.*—A fair crop on some farms, quite equal to last year; on others it was thin, being much damaged by the rooks. Quality not so good as last year, owing to the bad harvest weather. General average for the county would probably be about 35 to 36 bushels; from 3½ to 4 bushels sown.

Barley.—Very indifferent crop; thin, and much under an average bulk. Colour slightly damaged by the wet harvest, but weight and quality good—57 to 58 lb. "common," 54 to 58 lb. average. Yield much under last year—say about 11 bushels; general average would be about 33 bushels; from 3½ to 4 bushels sown.

Oats.—Until within a month of harvest had the appearance of being a fine crop, but then the very dry weather and high winds damaged it considerably, both as regards weight, bulk, and quality, and which was again increased by the wet harvest. Weight, from 39 to 42 lb.; average yield, about 35½ bushels—about 14½ bushels under last year's return; from 4 to 5 bushels sown.

Harvest began about the usual time—20th to 25th August. About the middle of July crops had the appearance of being late, but the unprecedented dry month or six weeks and high winds *hastened* the crops, and brought on harvest unnaturally soon—say about a fortnight sooner than was expected—about the 20th of July or thereabout.

Hay.—Crop not so good as last year; average would be about 23¼ cwt.—about 6¾ cwt. less than last year's return. Grass rather thin on the ground. Clover not so bad, especially on parts late cut. *Meadow-hay*—Scarcely any; where it was grown about an average of former years—say about 17½ cwt.

Potatoes.—About half the crop of last year; and in some parts a large quantity of disease. Cause—high wind for two or three days, followed with frost and very dry weather in August. Average yield, probably about 5 tons; but where diseased, about 4 tons might be nearer.

Turnips.—Generally very poor crop, especially swedes. On many large farms not a swede grown, having been all destroyed with the turnip-fly and frost in May and the first half of June, and which necessitated resowing in yellows—in some places two or three times. Little more than half the crop of last year. Average, say about 14 tons.

The damage from turnip-fly was much greater than any previous year before coming to the hoe; afterwards not so much damage by insects. But there is a good deal of finger-and-toe. No special injury by weeds, except by annuals, which in some cases stopped the growth of the young plant, while protecting it in some measure from the ravages of the fly.

Live Stock.—Pastures during the season scarcely of average growth and

quality with last year. During the month of August pastures disappeared quick, but revived a little in September after the rain. Stock throve very well on the whole. Cattle and sheep quite free from disease. *Clip of wool*—Quality about an average of former years.

NAIRNSHIRE. *Wheat.*—None grown.

Barley.—32 bushels; quality fair in some cases; grain and straw somewhat spoiled by rain during harvest.

Oats.—32 bushels; quality good.

Harvest began much about the usual time.

Hay.—Light crop. *Meadow-hay*—None.

Potatoes.—Fair crop; not quite so good as last year; quality good.

Turnips.—From 14 to 18 tons; quality good; brairded well, but destroyed by fly; greater part sown twice, in some cases three times.

Turnips injured by fly. No damage by weeds.

Live Stock.—Pastures during the season of average growth and quality with last year. Stock throve very well. Cattle and sheep free from disease.

INVERNESS-SHIRE (Inverness District). *Wheat.*—About 5 quarters grown=40 bushels; 4 bushels seed sown; quantity similar to last year, but very little sown; quality fair.

Barley.—Quantity, about 30 bushels average, instead of 40, last year's yield; quality inferior in colour to last year, but same good weight; 4 bushels sown.

Oats.—Fair crops of oats; but the protracted harvest, caused by heavy rains, spoiled the colour of grain; average about 4½ bushels; seed sown, from 4 to 6 bushels.

Harvest began about the usual time, but was protracted considerably, owing to rainy weather.

Hay.—Quantity about 1½ tons; quality very fair; about half a ton less return than in 1898. *Meadow-hay*—Crop about same as last year.

Potatoes.—About one-half of last year's crop. A little disease among the early varieties. The new varieties were least affected with disease.

Turnips.—There were not above 26 tons on best soils, while 15 to 20 tons were common. Some disease affected the crops. Some resowing had even to be resorted to.

More than usual damage by insects. Not above average weeds.

Live Stock.—Pastures during the season of average growth and quality with last year. Stock throve very well. Cattle and sheep free from disease. *Clip of wool*—Average.

INVERNESS-SHIRE (Skye). *Wheat.*—None grown.

Barley.—None grown.

Oats.—Owing to the dry summer the straw was short, but grain over the average as to quality and quantity; 6 bushels usually sown.

Harvest began ten days earlier than usual.

Hay.—A light crop of good quality. *Meadow-hay*—About the same as last year.

Potatoes.—A very poor crop; not more than two-thirds of an average. No new varieties grown.

Turnips.—About same as last year; finger-and-toe prevalent; only one sowing was required.

No injury by insects or weeds.

Live Stock.—Pastures during the season of average growth and quality with last year. Stock did well, particularly during latter half of season. Cattle and sheep free from disease. *Clip of wool*—Light; of good or average quality.

INVERNESS-SHIRE (Lochaber District). *Wheat.*—None grown.

Barley.—Very little grown.

Oats.—About 36 bushels; straw rather more abundant than usual.

Harvest began two weeks earlier than average time.

Hay.—About 1 ton 2 cwt.; quality fully better than usual, owing materially to the excellent weather had for haymaking. *Meadow-hay*—Productive crop, and very easily secured, owing to dry hot weather in summer months.

Potatoes.—About 6 tons; considerable degree of disease among earlier sorts.

Turnips.—About 6 tons; generally a bad crop. Some fields brairded well, but many required second sowing. Crop much damaged by finger-and-toe.

No injury by insects or weeds.

Live Stock.—Pastures rather under average, owing to drought. Stock throve fairly well. Cattle and sheep free from disease. *Clip of wool*—Good.

ROSS-SHIRE (Dingwall and Munlochy District). *Wheat.* Quantity and quality of grain average; also of straw; seed sown, about 4 bushels.

Barley.—Quantity of grain much below average; quality also a little below, say 36 bushels; straw also below average; seed, 4 bushels.

Oats.—Quantity and quality also below average. Quantity of straw about average; but quality much spoiled with wet weather in stook. Grain was also affected with sprouting. Quantity, 40 bushels; seed sown, 4 to 5 bushels.

Harvest began about the usual time, 20th August; was very protracted, owing to effects of a severe gale of wind, followed by wet weather.

Hay. — Quality not so good; quantity, average; weight, 1½ ton. *Meadow-hay*—None.

Potatoes.—The crop was not so heavy, say 7 tons; quality of roots average; not much disease.

Turnips. — The crop was light and various; generally very much affected with finger-and-toe disease; weight of swedes, from 8 tons up to 20 tons in a few cases; yellows, say 6 tons and up to 15 tons in some cases; brairded slowly and irregularly, owing to frosty nights and drought; more second sowing on that account.

No injury by insects. Not more than the usual weeds.

Live Stock.—Pastures during the season of average growth and quality with last year. Stock throve well. Cattle and sheep free from disease. *Clip of wool*—Average.

ROSS-SHIRE (Tain, Cromarty, and Invergordon District). *Wheat.*—34 to 36 bushels; fair quality; seed, 3½ to 4 bushels.

Barley.—32 to 34 bushels; fair average weight; colour not so good; seed, 3 to 3½ bushels.

Oats.—42 to 44 bushels; quality not so good as last year; greater quantity of straw; seed, 3½ to 4½ bushels.

Harvest began 20th to 24th August, about usual time.

Hay.—1½ to 1¾ ton; fair quality; fully as much clover as last year. *Meadow-hay*—None grown.

Potatoes.—Light; one-third less than last year; 4 to 5 tons; sound.

Turnips.—Worst ever grown in eastern district of Ross-shire. Finger-and-toe very prevalent, and much unsoundness; great deal of second sowing; 12 to 15 tons.

Not much damage by insects. Weeds of all descriptions, but principally annuals.

Live Stock.—Pastures fully average growth. Stock did only middling, owing to colds. Cattle and sheep free from disease. *Clip of wool*—Average.

SUTHERLAND. *Wheat.*—None grown.

Barley.—28 to 32 bushels; crop very variable; light weight; 3½ bushels.

Oats.—33 to 36 bushels; light weight; 5 to 6 bushels. A good deal of premature ripening.

Harvest began about usual time.

Hay.—A fair average crop; well secured; 1½ ton. *Meadow-hay*—Where grown, fair crop.

Potatoes.—Fair average crop; no disease; 6 to 7 tons.

Turnips.—Light, poor crop, with few exceptions; general average of weight can hardly be given. Generally one sowing only required; crop being fast consumed, little will be left for spring.

No injury by insects. Not more than usual injury by weeds.

Live Stock.—Pastures during the season of average growth and quality with last year. Stock throve well. Cattle and sheep free from disease. *Clip of wool*—Average; fair quality; wretched price; and both Cheviot and Blackface almost unsaleable.

CAITHNESS-SHIRE. *Wheat.*—Not grown.

Barley.—Fair crop of about 36 bushels, weighing 52 to 54 lb.; seed, 4 bushels.

Oats.—A fair crop, but short of straw; a yield of about 4 quarters; seed, 4 to 5 bushels.

Harvest about usual time.

Hay.—Much less than last year; about 1 ton. *Meadow-hay*—Fair.

Potatoes.—An excellent crop; free from disease; weight, 5 to 6 tons.

Turnips.—Much better crop than last year; in fact, it is the crop of the season. The crop brairded well, and was free from disease until about midsummer, when finger-and-toe made its appearance. Weight about 20 tons.

No damage by insects. Little or no growth of weeds except thistles, when allowed to grow uncut.

Live Stock.—Pastures during the season of average growth and quality with last year. Stock did well all season. Cattle and sheep free from disease. *Clip of wool*—About an average.

ORKNEY. *Wheat.*—None grown.

Bere.—The average yield was about 32 bushels, weighing about 48½ lb.; seed sown, 3½ to 4½ bushels.

Oats.—Both straw and grain under average, and considerably less than last year, the average of grain being about 28 bushels, weighing about 38 lb.; seed, 4 to 6 bushels.

Harvest began a week earlier than last year, but about a week after the usual time.

Hay.—A fair good crop; quantity about 25 cwt.

Potatoes.—A poor crop, about the same as last year; weight about 3 tons.

Turnips brairded well, and are fully as good a crop as last year; weight about 11 tons.

There was little damage done by insects, and not much weeds.

Live Stock.—Pastures were good all season. There was an epidemic of influenza among horses last spring, but with this exception stock were healthy, and throve well. *Clip of wool*—Average.

SHETLAND (Island of Unst). No *wheat* grown in this district.

Barley.—Yield about 26 bushels; the quality of grain and straw better than last year; seed sown, about 4 bushels.

Oats.—Yield about 24 bushels; quality of grain and straw good, similar to last year; seed sown, 5 bushels.

Harvest was general about 15th September, being a week to ten days earlier than average years.

Hay.—Weight not known, but both quantity and quality very much above average. *Meadow-hay*—More productive, and of excellent quality.

Potatoes.—Yield in tons not known, but quantity and quality much above average years; no disease; no new varieties sown.

Turnips.—Crop in some instances good; others much injured by finger-and-toe disease. Early sown brairded well, and came on quickly to the singling; late sown very bad braird owing to drought. In some cases three or four sowings were necessary. Weight not known.

Only crop injured by insects was the turnip. Very little damage from weeds.

Live Stock.—During the spring grass very short owing to snow and frost, but very abundant during summer and autumn, and of fine quality. Stock throve very well. No contagious disease among cattle or sheep. Amongst ponies there was an outbreak of strangles in the summer months. *Clip of wool*—About an average, but many broken fleeces owing to low condition of flock, caused by extremely severe weather during March, April, and May.

SHETLAND (Lerwick District). *Wheat.*—None.

Barley.—Both in quantity and quality grain and straw are superior to last year.

Oats.—Quantity about the same as last year; quality superior.

Harvest began about the usual time.

Hay.—Quantity and quality better than last year, both as regards rye-grass and clover. *Meadow-hay*—Rather more productive.

Potatoes.—The yield is considerably above last year, and the quality is good; no disease; no new varieties.

Turnips.—The weight of crop is more than last year, and the quality is better—indeed excellent. The crop brairded well, and no second sowing was required.

No damage from insects or from weeds.

Live Stock.—Both in growth and quality the pastures were superior to last year. Stock throve very well indeed. No disease. *Clip of wool*—The quality was good; about an average clip.

THE METEOROLOGY OF 1899.

The following table gives a comparison of the winds, mean pressure, temperature, rainfall, cloud, and sunshine for 1899 as compared with the previous forty-four years' averages :—

TABLE SHOWING FOR WIND DIRECTION AND FORCE, MEAN BAROMETRIC PRESSURE, MEAN TEMPERATURE, RAINFALL, CLOUD, AND SUNSHINE, THE EXCESS ABOVE, OR THE DEFECT FROM, THE AVERAGES FOR ALL SCOTLAND FOR THE PREVIOUS FORTY-FOUR YEARS.

	Direction of Winds—Days.									Wind Force.	Barometric Pressure.	Temperature.	Rainfall.	Cloud.	Sunshine.
	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calms.	lb. per sq. ft.	inches.	°	inches	0 to 10.	hours.
Jan.	0	0	1	0	-1	0	-1	0	1	-0·50	-0·105	-0·5	1·12	2	-6
Feb.	0	0	0	0	1	1	-2	-1	1	-0·68	-0·090	0·1	-0·37	-5	3
March	1	-1	-2	-2	-1	2	1	1	1	-0·05	0·120	0·8	0·74	-1	-9
April	0	2	-2	-1	0	1	0	1	-1	0·27	-0·158	-1·1	1·73	4	-34
May	0	2	3	0	-1	-1	-2	-1	0	-0·05	0·087	-2·7	1·01	-1	-9
June	0	0	1	0	0	-2	1	0	1	-0·23	0·110	2·6	-0·68	-3	15
July	0	0	0	0	0	-1	2	-1	0	0·11	0·144	2·0	0·29	3	-22
August	-1	1	2	1	0	-2	-1	-1	1	-0·22	0·218	3·5	-2·29	-8	57
Sept.	0	-1	-2	-1	-1	-1	5	2	0	0·69	-0·131	-0·9	1·05	1	-9
Oct.	-1	-1	-1	-1	0	1	2	0	1	-0·03	0·131	1·4	-0·05	-5	-6
Nov.	-2	-2	-2	-2	1	4	3	0	0	1·40	0·087	5·8	1·03	6	-14
Dec.	-1	0	3	3	1	-3	-3	-1	1	-0·18	0·020	-2·2	0·10	9	-12
Year	-4	0	1	-3	-1	-1	5	-1	6		0·032	0·6	2·78	0	-46

Hence the year 1899 was characterised by a large excess of easterly winds in May and also in December, the temperature of these months being respectively 2°·7 and 2°·2 under their averages. On the other hand, southerly winds prevailed eight days more than the average in November, accompanied with a mean temperature of 46°·4, or 5°·8 above the average, an excess of southerly winds and of temperature hitherto unparalleled for November. Calms were also exceptionally prevalent. In August the type of weather was eminently anticyclonic, with excessive heat and dryness of the atmosphere, small rainfall, and strong sunshine, exceeding the average by 57 hours—a figure higher than has been recorded for August since 1876.

JANUARY.—The mean temperature of the month was 36°·6, or 0°·5 under the average, the days being the average, and the nights

a degree below it, the lower temperature being thus wholly caused by the greater cold of the nights. In the south generally temperature was above the average, the greatest excess, about a degree, in the south-west from Islay to Stranraer; whereas to the north of the Forth and Clyde, temperature was under the average, the lowest temperatures, about two degrees under the average, being in inland situations from the Pentland Firth to Strathtay.

The mean rainfall was 5·02 inches, or 29 per cent above the average, but the amounts were most irregularly distributed over Scotland. It was above the average in Shetland, Orkney, and over the whole of the east side of the country for a great way inland, and, except at one or two scattered stations, everywhere to the south of the Grampians. In Caithness and some parts of Aberdeenshire the rainfall was more than double the average, but south of the Grampians the excess was nowhere excessive, exceeding a half more at only one or two places. On the other hand, in the west, from Oban to Cape Wrath, the rainfall fell short of the average, the deficiency being from 10 to 60 per cent. Very little rain fell after the 23rd.

FEBRUARY.—The mean temperature was 38°·5, or nearly the average. The days were 0°·8 above, but the nights 1°·0 under the average, thus resulting in a very large daily range, with which the low humidity was in accordance. The distribution of the temperature was very peculiar. It was slightly less than the average from the head of the Moray Firth through the Caledonian Canal to Fort William, and thence eastwards through inland situations in the counties of Forfar, Perth, Dumbarton, Stirling, and the Lothians; but the deficiency amounted to only a degree. In all other parts temperature was above the average, the greatest excess reaching nearly a degree and a half in districts surrounding Peterhead, the east of Orkney, the Outer Hebrides, Firth of Clyde, South Ayrshire, and Hawick. Temperature was low during the first week and towards the end of the month.

The mean rainfall was 2·69 inches, or 12 per cent less than the average. It was above the average in the counties of Forfar, East Perth, East Fife, and at isolated places such as Monach, Airds, Cargen, and Wolflee, the excess being small, except at Lednathie and Airds, where it was respectively 73 and 44 per cent. In all other districts less than the usual quantity fell, the greatest deficiencies being 81 per cent at Glencarron and 69 per cent at Lairg, but over widespread breadths the rainfall was less than a third of the average. Nearly the whole of the rain fell from the 7th to the 18th, scarcely any falling during the rest of the month.

MARCH.—The mean temperature was 40°·2, or 0° 8 above the average, the days being 1°·3 and the nights 0°·8 in excess, the higher temperature being thus chiefly occasioned by the greater warmth of the days. In Shetland temperature was a degree less than the average, in Orkney about the average, but above it over the mainland of Scotland, increasing on proceeding southward, till in the south of Argyll, in Renfrew and Ayr, it amounted from 1°·5 to 2°·0. Temperature was very high during the week ending the 18th, rising 6°·0 above the average of the month; whereas for the following week very low temperatures ruled, accompanied with snow and hail, and over central Scotland the mean was 7°·5 under the average.

The mean rainfall was 3·45 inches, or 26 per cent above the average. It was less than the average in Skye, the north-east of Caithness and Aberdeen; along the east coasts from Montrose to the Tweed; and in the counties of Ayr and Wigtown. The deficiency in these districts was, however, comparatively slight. In all other parts of the country the rainfall was above the average. Except in a few places the excess did not exceed 25 per cent. The largest excess was 85 per cent at Stornoway, Cromarty, and Dumfries, and a little over 50 per cent at Dunrossness, Inverness, Fort William, Ballachulish, Airds, Glasgow, and Cargen. The rains were most general and heavy from the 1st to the 10th, and from the 24th to the end of the month.

APRIL.—The mean temperature was 43°·0, or 1°·1 under the average, the days being 1°·5 and the nights 0°·8 colder than usual. The deficiency was pretty equally distributed over the mainland of Scotland, being rather greater to the north than to the south of the Grampians. In Shetland, however, the depression below the average of the month was as much as 2 ·5, whereas at coast stations from Peterhead to the Tweed the deficiency scarcely amounted to a degree.

The mean rainfall was 3·87 inches, or 81 per cent above the average. This was one of the very few months that have occurred when the rainfall exceeded the average in all parts of the country. Further, this rainfall for April has since 1856 only been exceeded in April 1867 and 1871, the amounts being then respectively 4·43 inches and 4·08 inches. Over wide districts considerably more than double the average rainfall was precipitated. The following show for a few places the percentages of excess: 215 at Nairn, 195 at Cromarty, 176 at Cawdor, 160 at Lednathie and Campbelton, 150 at Monach and Gordon Castle, and 130 at Dunrobin, Inverness, and Poltalloch. The persistent rainy character of the weather of this month is shown by the circumstance that on each of the thirty days rain is reported from quite a large number of places somewhere in

Scotland; and a singular feature of this rainy track is that though the monthly amounts at the stations are great, large single daily falls are conspicuously rare.

MAY.—The mean temperature of the month was 46°·3, or 2°·7 less than the average, the deficiency of the days and nights being nearly equal. The low temperature was occasioned by the prevalence of easterly winds, which were five days above the average. It also resulted from these easterly winds that temperatures were very much lower at eastern than at western stations. At eastern stations the deficiency in the north was 2°·0, increasing on proceeding southward till in Tweeddale it was nearly 4°·0. But as these winds proceeded in their westerly course across the country they markedly acquired a higher temperature, till at coast stations in the west the depression of temperature was less than a degree. Thus while at Hawick the temperature was 4°·2 under the average, at Campbelton it was only 0°·4.

The rainfall was 3·29 inches, or 45 per cent above the average, which is one of the largest rainfalls of May since 1856. Its distribution was extremely irregular, being less than the average in the north-east of Scotland, north of Donside, and over western districts to west of a line from Islay, passing Inveraray, Kingussie, Fort Augustus, Glencarron, and the Butt of Lewis. The deficiency was comparatively small, scarcely anywhere amounting to half the average of the place. In all other parts of the country the average was exceeded, in many districts largely so. The more remarkable heavy monthly falls were, stated in percentages above the average,—142 at Thurso and Mull of Galloway; 125 at Dundee, Smeaton, Leith, and Glasgow; and 100 at Pladda, Haddington, Perth, Arbroath, and Roeberry in Orkney. It fell mostly from the 13th to the 20th, very large falls being common on the 15th, 16th, and 17th in the west from Ardnamurchan northwards; and in other localities on the 18th, 19th, and 20th.

JUNE.—The mean temperature was 57°·4, or 2°·6 above the average; but while the nights were 1°·4 above the average, the days were 3°·7, thus pointing to the clear skies and strong sunshine accompanying the anticyclonic type of weather which generally prevailed. Further, temperatures exceeded the average in all inland situations in a much greater degree than prevailed all round the coasts. In many inland situations the excess was from three to four degrees, whereas at many places near the sea the excess was only a little over a degree.

The mean rainfall was 1·80 inch, or 27 per cent less than the average. The distribution was quite peculiar, being above the

average in Galloway, the Outer Hebrides, Orkney, and Shetland, but the excess in every case was small. In all other districts the fall was less than the average, but the deficiency scarcely half the average in all localities. Nearly all the rain fell from the 1st to the 6th, and from the 17th to the end of the month. During the month fogs were frequent and widespread to a degree that has seldom been recorded.

JULY.—The mean temperature was 59°·1, or 2°·0 above the average, the excess of the days being 1°·4 and of the nights 2°·5. The excess was greatest to south of a line drawn from Fraserburgh to Islay, being from 2°·5 to 3°·0. On the other hand, the excess was least at strictly western stations, where at several places it was less than a degree.

The mean rainfall was 3·46 inches, or 9 per cent above the average. Its distribution over the country was extremely irregular, being above the average in Ross-shire, immediately south of the Moray Firth, and in the counties of Argyll, Bute, Renfrew, Dumbarton, Stirling, West- and Mid-Lothian, and Berwick. The greatest excess in percentages was 86 at Duns Castle, 58 at Haddo House and Poltalloch, and fully 30 at many places. But the rainfall was under the average in the Outer Hebrides, Galloway, East Lothian, Forfar, Kincardine, Inverness, and Caithness. Over extensive districts the deficiency was from a fourth to half the average.

AUGUST.—The mean temperature was 60°·1, or 3°·5 above the average, the days being 5°·2 and the nights only 1°·8 above the average. This is the highest mean temperature hitherto recorded by the Society's observers for August, and it will be noted that it was occasioned by the strongly marked anticyclonic character of the weather which prevailed, with the accompanying high barometric pressure, clear dry atmosphere, and large daily range of temperature. Since light easterly winds prevailed, it followed that temperatures were very much higher in the west than in the east of Scotland. Thus, while on the coast from Fraserburgh to the Tay the excess scarcely exceeded a degree, in the west it was generally from four to five degrees. In Shetland the excess was less than a degree, but in Orkney it exceeded two degrees.

The mean rainfall was 1·34 inch, or 64 per cent less than the average. At every station the rainfall was light, and over extensive districts the amount collected did not amount to a fifth part of the average rainfall of August. Such rain as did occur fell from the 15th to the 19th, and from the 25th to the 31st. Towards the end of the month thunderstorms occurred at many places.

SEPTEMBER.—The mean temperature was 51°·9, or 0°·9 under the average, the days being 0°·2 and the nights 1°·6 under the average. This diminution of temperature was, on the whole, spread uniformly over Scotland.

The mean rainfall was 4·59 inches, or 30 per cent above the average. Its distribution was exceedingly unequal, being under the average in Galloway, Fife, and the east of Forfarshire, but the deficiency was in all cases small. On the other hand, over the whole of the rest of Scotland it was above the average, particularly over the west from Mull to Orkney, being considerably more than double the average at individual stations in Orkney, Caithness, and the Outer Hebrides. To the south of the Grampians excess at one or two places did not exceed 25 per cent. The daily maps of rainfall show impressively that September was emphatically a wet month over Scotland, with the singular speciality that in comparatively few instances did the amount of the daily rainfall amount to an inch.

OCTOBER.—The mean temperature was 47°·8, or 1°·4 above the average, the days being in excess 2°·6 and the nights 0°·2. The higher temperature was thus caused, almost wholly, by the greater warmth of the days, owing to the clear dry atmosphere and strong sunshine of the anticyclones which formed so characteristic a feature of the weather of the month. The excess of temperature was greatest, from 2°·0 to 2°·5, in the counties of Argyll, Bute, Renfrew, and Lanark; and least, being less than a degree, in Galloway.

The mean rainfall was 3·10 inches, or 24 per cent under the average. Generally the rainfall was slightly more than the average in inland situations north of the Forth and Clyde, in Orkney, Shetland, and the middle portion of the Hebrides. Elsewhere it was under the average. The greatest deficiency occurred to the east of a line drawn from Dunrobin, passing through Inverness, Braemar, Perth, and Cupar, amounting to 70 per cent at Cromarty, Lednathie, Montrose, Aberdeen, Logie-Coldstone, and Peterhead. The weather was fine and rainfall light from the 5th to the 9th, and from the 14th to the 24th. At Tillypronie 1·78 inch fell on the 1st, whereas at Aberdeen the largest fall on any day was only 0·14 inch on the 10th. Thunderstorms with hail occurred on the 30th.

NOVEMBER.—The mean temperature was 46°·4, or 5°·8 above the average of the month, the excess being nearly equally divided between the days and the nights. This is a "record" temperature, being a higher mean for November than any that has hitherto occurred since 1763, when observations of temperature began to be made in Scotland. In all parts of the coun-

try the excess was high, but south of the Caledonian Canal it was about two degrees higher than to the north of it. The highest means, 6°·7 above the average, were noted in West Perthshire and in Lower Clydesdale.

The mean rainfall was 4·85 inches, or 27 per cent above the average. Its distribution over the country was quite peculiar, being under the average on the east coast and for some distance inland from the Pentland Firth to the Lower Tweed; and also at coast stations in the west from Islay to the Mull of Galloway. The deficiency was greatest in the extreme north-east of Scotland, where it exceeded 60 per cent. In all other districts it was above the average, more particularly in inland districts, where in several places more than double the average fell, and at many places the excess was fully 70 per cent. The fall was light from the 15th to the 19th, and from the 27th to the 29th. For the first half of the month the rains were continuous and heavy; and from the 1st to the 12th stormy weather prevailed. During the last ten days heavy rains characterised the weather in the west, whereas in the east the rainfall was intermittent and light.

DECEMBER.—The mean temperature was 35°·6, or 2°·2 less than the average, the deficiency being equally distributed between the days and the nights. The deficiency was considerably greater to the south of the Caledonian Canal than to the north of it; thus while in inland situations it fully exceeded 3°·0, it did not amount to a degree in the Hebrides, Shetland, Orkney, and the north coasts of Sutherland and Caithness.

The mean rainfall was 4·16 inches, or 5 per cent above the average. Its distribution over the country was just the reverse of what prevailed in the previous month. It was under the average over a broad belt of country extending northwestwards from the Cheviots and the Solway, bounded on the south by a line joining Dumfries and Melrose, and on the north by a line joining the south of Harris and Cape Wrath. The deficiency was greatest, about 50 per cent, in the south-west of Inverness-shire. In the rest of Scotland more than the average fell, the excess being very large along the Moray Firth from Wick to Gordon Castle; in Forfarshire, Wigtownshire, and the south-west of Argyll. At Cromarty and Nairn fully double the average amount was collected. Much rain fell from the 3rd to the 7th, and from the 20th to the end of the month. During the first week fogs were frequent at western stations.

The harvest of 1899 was generally earlier than usual, particularly in the south, being from seven to ten days earlier.

In the principal grain-growing districts north of the Forth and Clyde the cutting began nearly at the average date. In the earlier districts where cutting was over and the grain mostly secured in the stackyard before the weather broke towards the close of August the yield was satisfactory; but no little damage was done by the rains which followed.

Wheat was, on the whole, an average crop, but above it in the counties of Forfar, Clackmannan, and West of Fife. *Barley* was above the average in the same counties, and also in Wigtownshire and part of Aberdeenshire; but over large breadths south of the Moray Firth and the Firths of Forth and Clyde the crop was a good deal under the average. *Bere* in Caithness, Orkney, and Shetland showed a good yield. *Oats* were a good crop in Shetland, Skye, Forfar, and Bute, but elsewhere the crop was generally a disappointing one.

Potatoes were a very poor crop, the deficiency in many districts varying from a fourth to a half of the usual crop, and disease appeared in many places especially after pitting; and the *turnip* crop was even worse, except in one or two districts. In the northern districts of Shetland, Orkney, and Caithness the root crops gave a satisfactory yield.

AGRICULTURAL STATISTICS.—Returned upon 5th June 1899.—(*Compiled from the Government Returns.*)

Table No. 1.—Acreage under each kind of Crop, Bare Fallow, and Grass, in each County of Scotland.

Counties.	Total Acreage under Orops, Bare Fallow, and Grass.	Corn Crops.							Green Crops.							Clover, Sainfoin, and Grasses under Rotation.	Permanent Pasture (exclusive of Mountain Land).	Flax.	Small Fruit.	Bare Fallow or Uncropped Arable Land.
		Wheat.	Barley or Bere.	Oats.	Bye.	Beans.	Peas.	Total.	Potatoes.	Turnips.	Mangels.	Cabbage, Kohl-rabi, and Rape.	Vetches or Tares.	Other Green Crops.	Total.					
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
1. Aberdeen	630,121	4	29,415	184,478	221	436	360	214,920	7,446	90,003	4	121	2,259	276	100,109	283,968	30,563	..	377	184
2. Argyll	134,709	5	1,726	17,326	738	99	18	19,912	4,576	5,523	29	180	18	22	10,348	27,807	76,137	..	45	460
3. Ayr	321,172	1,197	1,634	45,271	161	923	46	49,232	7,818	7,018	577	791	32	267	16,503	102,644	152,503	..	143	147
4. Banff	160,260	24	10,504	46,874	79	127	32	57,640	1,999	22,050	4	33	926	10	25,031	67,665	9,826	..	10	88
5. Berwick	190,701	2,120	21,143	33,375	23	938	27	57,626	2,413	27,844	183	544	790	52	31,826	58,182	42,978	..	25	64
6. Bute	25,728	12	85	4,954	90	70	12	5,223	959	1,538	11	85	13	8	2,614	8,305	9,407	..	83	96
7. Caithness	111,869	1	1,257	33,758	76	1	20	35,113	1,724	13,864	1	40	404	15	16,051	32,205	28,438	..	3	59
8. Clackmannan	15,657	214	591	3,021	52	387	..	4,265	317	774	1	11	17	26	1,146	3,474	6,560	..	14	189
9. Dumbarton	51,426	978	246	6,842	16	197	5	8,284	2,329	1,492	87	242	48	16	4,164	16,416	22,432	..	63	67
10. Dumfries	259,764	142	831	43,370	29	24	18	44,414	3,444	18,712	179	1,126	40	50	23,551	80,838	110,790	..	65	106
11. Edinburgh	132,833	4,158	5,804	22,812	23	100	136	33,033	5,213	12,282	41	1,005	388	425	19,354	32,813	47,279	..	295	59
12. Elgin	101,689	1,209	14,432	20,213	582	48	13	36,497	1,677	15,656	13	8	428	11	17,793	38,964	8,378	1	17	44
13. Fife	255,885	9,270	22,475	38,732	928	1,217	15	72,637	14,502	25,119	51	470	749	54	40,945	65,567	75,895	..	173	668
14. Forfar	251,276	8,572	30,095	47,858	954	596	69	88,144	12,159	34,151	66	252	405	98	47,221	86,634	28,936	..	233	108
15. Haddington	111,902	5,087	16,382	17,314	19	561	80	39,463	7,465	16,103	128	441	198	289	24,624	27,539	19,852	..	380	44
16. Inverness	148,766	5	7,502	30,051	744	5	20	38,333	5,946	10,693	11	30	122	25	16,827	31,365	61,740	..	37	464
17. Kincardine	120,685	692	13,520	27,517	115	588	14	42,446	2,427	18,131	2	18	447	134	21,159	48,257	8,742	..	79	2
18. Kinross	35,357	82	436	6,297	80	44	..	6,939	570	2,778	..	79	53	1	3,481	12,576	12,323	..	19	19
19. Kirkcudbright	191,626	104	106	27,255	28	24	12	27,529	1,452	12,523	48	1,696	21	42	15,782	63,348	84,845	..	22	100
20. Lanark	255,841	2,184	409	37,651	36	783	47	41,110	4,117	9,824	36	2,014	279	330	16,600	102,006	93,734	..	2,059	332
21. Linlithgow	58,699	1,296	3,498	9,778	14	270	4	14,860	1,726	3,948	18	269	184	12	6,152	15,054	22,456	..	27	150
22. Nairn	25,748	1	3,447	5,491	81	..	2	9,022	317	4,252	3	..	23	6	4,601	10,014	2,087	..	2	22
23. Orkney	107,376	..	4,600	33,620	..	14	34	38,268	2,722	14,501	5	40	308	30	17,606	33,805	17,140	..	..	257
24. Shetland	59,687	..	2,003	7,292	32	..	..	9,327	3,111	1,337	..	478	3	..	4,939	1,245	43,717	..	..	469
25. Peebles	48,607	7	459	8,164	4	..	14	8,648	371	4,139	1	451	51	5	5,018	18,254	16,669	..	13	5
26. Perth	338,031	5,104	15,398	64,553	520	2,082	69	87,726	12,128	29,270	37	462	372	39	42,308	100,371	105,146	..	1,017	1,163
27. Renfrew	92,695	1,687	57	11,249	20	296	13	13,322	2,964	2,360	43	409	28	54	5,858	24,773	48,551	..	101	90
28. Ross & Cromarty	141,324	813	12,853	29,685	801	23	31	44,206	7,559	16,188	58	40	481	9	24,330	43,219	29,342	..	31	196
29. Roxburgh	182,387	518	13,231	29,028	9	147	33	42,966	1,264	22,069	36	708	268	34	24,379	52,650	62,236	..	48	58
30. Selkirk	30,054	..	476	4,746	3	2	12	5,239	225	2,843	..	185	42	1	3,296	9,116	12,391	..	12	..
31. Stirling	118,670	1,361	3,497	17,965	41	2,945	10	25,819	2,949	4,501	15	321	255	30	8,071	31,541	52,017	..	135	1,087
32. Sutherland	32,884	..	1,367	7,862	113	4	20	9,886	1,671	3,088	..	8	38	..	4,805	9,002	9,520	..	1	100
33. Wigtown	154,311	459	947	33,471	28	219	1	35,125	1,425	15,708	152	410	51	95	17,841	66,977	34,033	..	24	311
Total	4,897,690	47,256	240,496	957,873	6,660	13,190	1,199	1,266,674	126,985	470,277	1,785	12,967	9,331	2,478	624,323	1,606,654	1,886,077	1	5,553	7,508

TABLE No. 2.—ESTIMATED TOTAL PRODUCE OF WHEAT, BARLEY, AND OATS, ACREAGE and Estimated AVERAGE YIELD per Acre in the Year 1898, compared with the Estimated YIELD for the Years 1897 and 1896, and the AVERAGE of the Ten Years, 1888-97, in each COUNTY of SCOTLAND.

COUNTIES.	WHEAT. Total Produce in 1898.	WHEAT. Acreage in 1898.	WHEAT. Average Yield per Acre. 1898.	WHEAT. Average Yield per Acre. 1897.	WHEAT. Average Yield per Acre. 1896.	WHEAT. Average of the Ten Years, 1888-97.	BARLEY, INCLUDING BERE. Total Produce in 1898.	BARLEY. Acreage in 1898.	BARLEY. Average Yield per Acre. 1898.	BARLEY. Average Yield per Acre. 1897.	BARLEY. Average Yield per Acre. 1896.	BARLEY. Average of the Ten Years, 1888-97.	OATS. Total Produce in 1898.	OATS. Acreage in 1898.	OATS. Average Yield per Acre. 1898.	OATS. Average Yield per Acre. 1897.	OATS. Average Yield per Acre. 1896.	OATS. Average of the Ten Years, 1888-97.
	Bush.	Acres.	Bush.	Bush.	Bush.	Bush.	Bush.	Acres.	Bush.	Bush.	Bush.	Bush.	Bush.	Acres.	Bush.	Bush.	Bush.	Bush.
Aberdeen	721	21	34.33	32.00	38.91	29.16	1,147,859	32,942	34.84	37.52	35.76	34.03	6,170,109	181,546	33.99	35.18	36.44	34.83
Argyll	..	..	..	..	..	..	51,488	1,578	32.63	30.56	34.42	31.11	576,572	17,547	32.31	29.70	30.80	30.74
Ayr	77,162	1,992	38.74	37.15	35.16	37.57	58,272	1,401	41.59	37.30	41.47	38.75	2,009,390	44,551	46.11	43.01	46.10	45.13
Banff	265	7	37.86	28.75	32.00	30.51	455,576	11,725	38.86	37.85	37.06	35.03	1,795,744	45,714	39.28	35.51	35.88	31.57
Berwick	128,140	3,211	39.87	33.78	35.75	32.81	810,972	19,632	41.31	36.62	36.70	35.31	1,232,365	33,411	36.85	39.24	35.68	35.05
Bute	974	25	38.96	38.67	24.00	..	5,764	141	40.88	40.81	43.46	39.57	196,703	4,972	39.58	37.54	35.84	36.05
Caithness	..	..	..	15.20	12.00	15.76*	34,914	1,105	31.60	21.91	27.47	32.49	1,140,302	34,138	33.41	20.58	29.13	32.71
Clackmannan	14,953	355	42.12	42.59	30.39	36.15	15,972	428	37.32	38.41	42.27	35.81	135,762	3,064	44.31	45.45	45.37	43.41
Dumbarton	46,565	1,123	41.46	38.20	40.37	39.18	9,038	210	43.04	42.09	44.21	40.30	291,233	6,896	42.23	39.88	43.77	41.48
Dumfries	5,683	137	41.48	36.26	42.00	34.39	31,189	783	39.83	35.11	35.59	33.79	1,575,695	43,937	35.86	34.13	31.71	33.76
Edinburgh	248,318	5,053	49.14	43.55	44.49	42.52	228,805	4,739	48.30	42.55	44.53	43.40	984,994	23,241	42.38	42.72	43.71	43.01
Elgin or Moray	53,569	1,315	40.74	40.58	37.64	34.01	577,195	15,194	37.99	37.06	36.13	34.07	757,560	19,645	38.56	36.46	36.62	35.32
Fife	442,988	10,450	42.39	34.46	37.23	33.67	905,264	21,341	42.42	34.88	36.55	34.33	1,605,751	39,044	41.18	42.53	42.58	37.96
Forfar	342,958	8,439	40.64	37.98	37.89	33.68	1,201,923	29,549	40.68	36.64	37.54	36.67	1,912,746	47,836	39.99	44.31	43.19	44.68
Haddington	289,206	6,349	45.55	35.70	38.75	37.51	701,582	14,714	47.68	40.87	42.86	41.37	749,544	17,403	43.07	43.39	45.15	45.18
Inverness	1,883	60	31.38	30.77	35.62	35.23	222,240	7,695	28.88	30.33	34.74	31.71	957,506	29,850	32.08	30.85	34.29	31.10
Kincardine	21,595	526	41.06	38.78	35.54	35.34	545,646	13,925	39.18	38.32	38.52	35.17	1,050,321	27,703	37.91	40.32	41.09	39.04
Kinross	1,348	34	39.65	38.00	..	30.54†	15,180	421	36.06	35.03	34.02	35.75	188,552	6,366	29.62	29.03	29.06	33.63
Kirkcudbright	3,985	107	37.24	33.37	30.68	30.44	2,975	78	38.14	35.85	30.31	31.76	973,866	27,536	35.37	34.80	32.92	33.50
Lanark	97,024	2,567	37.80	33.38	36.04	36.38	12,054	350	34.44	30.85	32.53	35.64	1,440,834	37,691	38.23	34.72	35.33	35.72
Linlithgow	74,876	1,527	49.03	41.10	43.94	37.98	151,944	3,035	50.06	42.79	43.90	42.89	413,978	9,740	42.50	44.44	45.92	43.62
Nairn	884	27	32.74	37.00	30.00	30.31	128,058	3,607	35.50	36.39	34.16	31.70	190,903	5,315	35.92	35.64	36.18	35.30
Orkney	..	..	..	..	..	..	156,698	4,711	33.26	33.15	33.84	32.42	967,408	33,479	28.90	28.07	29.84	27.60
Peebles	422	13	32.46	27.69	32.00	30.32*	13,011	381	34.15	31.46	34.42	33.47	278,024	8,174	34.01	30.98	34.67	33.87
Perth	268,070	6,096	43.97	40.66	40.19	35.90	568,208	14,672	38.73	36.27	34.17	34.39	2,463,473	63,985	38.50	37.37	35.18	35.14
Renfrew	72,576	1,879	38.62	37.60	42.01	40.93	5,625	131	42.94	40.13	42.12	43.01	482,866	11,330	42.62	42.05	42.61	43.95
Ross and Cromarty	39,489	1,090	36.23	37.98	43.00	40.34	471,990	13,200	35.76	36.98	40.79	38.50	1,069,857	29,510	36.25	36.99	42.32	39.14
Roxburgh	29,793	779	38.25	33.33	33.41	32.47	508,732	12,379	41.10	34.68	34.93	35.08	1,087,279	29,540	36.81	36.90	33.52	35.75
Selkirk	252	7	36.00	30.00	..	26.33‡	17,087	480	35.60	31.49	28.93	30.79	170,198	5,050	33.70	36.91	34.77	32.95
Shetland	..	..	..	..	..	..	51,607	1,982	26.04	26.97	22.79	24.36	175,980	7,387	23.82	31.10	21.25	22.58
Stirling	90,304	2,109	42.82	40.42	35.22	34.10	116,124	3,093	37.74	36.33	39.52	35.70	765,366	18,296	41.83	41.56	40.97	39.30
Sutherland	..	..	..	..	..	..	42,714	1,476	28.94	28.07	33.02	32.16	215,259	7,887	27.29	26.47	31.17	32.38
Wigtown	18,380	560	32.82	28.43	29.60	27.99	31,187	886	35.20	33.80	33.31	31.46	1,161,594	33,519	34.65	33.31	33.64	36.92
Total	2,372,383	55,861	42.47	37.88	38.47	35.80	9,296,983	237,984	39.07	36.63	37.14	35.77	35,248,218	955,933	36.87	36.60	37.13	36.50

* Average of 9 years only. † Average of 8 years only. ‡ Average of 6 years only

TABLE No. 3.—ESTIMATED TOTAL PRODUCE OF BEANS, PEAS, AND POTATOES, ACREAGE and Estimated AVERAGE YIELD per Acre in the Year 1898, compared with the Estimated YIELD for the Years 1897 and 1896, and the AVERAGE of the Ten Years, 1888-97, in each COUNTY of SCOTLAND.

COUNTIES.	BEANS.						PEAS.						POTATOES.					
	Total Produce in 1898.	Acreage in 1898.	Average Yield per Acre.			Average of the Ten Years, 1888-97.	Total Produce in 1898.	Acreage in 1898.	Average Yield per Acre.			Average of the Ten Years, 1888-97.	Total Produce in 1898.	Acreage in 1898.	Average Yield per Acre.			Average of the Ten Years, 1888-97.
			1898.	1897.	1896.				1898.	1897.	1896.				1898.	1897.	1896.	
	Bush.	Acres.	Bush.	Bush.	Bush.	Bush.	Bush.	Acres.	Bush.	Bush.	Bush.	Bush.	Tons.	Acres.	Tons.	Tons.	Tons.	Tons.
Aberdeen	9,909	429	23.10	25.43	24.40	24.50	6,609	312	21.18	21.72	23.39	22.06	50,605	7,322	6.91	4.70	4.98	5.08
Argyll	2,229	110	20.26	18.48	15.29	20.05	307	16	19.19	17.77	19.00	20.22	23,447	4,759	4.98	3.85	4.37	4.88
Ayr	23,973	662	36.21	34.58	34.17	32.71	1,941	55	35.29	35.41	34.50	34.78	51,360	7,297	7.04	4.72	7.10	6.20
Banff	3,077	137	29.46	26.60	26.62	25.35	911	50	18.22	22.73	21.60	21.82	14,467	1,969	7.35	4.86	6.20	5.12
Berwick	39,194	1,087	36.06	32.58	34.32	31.59	1,075	41	26.22	28.89	31.97	25.35	17,164	2,413	7.11	6.08	8.40	6.05
Bute	1,247	48	25.98	23.67	15.56	22.47	239	12	19.92	18.47	21.37	18.63	6,567	961	6.83	4.10	5.81	6.20
Caithness	31	4	7.75	9.00	6.00	10.91	451	33	13.67	14.87	8.74	13.93	10,278	1,633	6.29	4.33	2.48	4.63
Clackmannan	16,835	488	33.47	33.89	35.95	32.15	..	..	..	34.00	..	—	8,068	827	9.38	8.88	9.87	7.97
Dumbarton	4,261	174	24.49	22.77	27.31	27.63	197	8	24.62	16.27	21.16	19.34	20,884	2,308	9.05	4.52	9.10	7.48
Dumfries	875	30	29.17	28.64	29.71	26.90	158	7	22.57	21.80	26.00	23.24	24,040	3,523	6.82	3.80	7.13	5.92
Edinburgh	2,916	87	33.52	32.40	35.26	32.68	3,733	136	27.45	25.99	27.42	24.59	38,458	5,125	7.50	6.87	7.79	6.56
Elgin or Moray	2,891	83	34.83	33.02	28.68	27.11	345	12	28.75	29.50	21.32	22.41	8,992	1,709	5.26	4.72	5.70	4.69
Fife	49,717	1,255	39.62	33.74	34.82	33.42	1,376	43	32.00	27.42	32.39	28.81	96,120	14,264	6.74	3.50	6.00	4.84
Forfar	23,858	704	33.89	31.62	33.05	31.76	2,327	89	26.15	27.97	29.62	27.32	85,277	11,965	7.13	4.05	6.96	5.39
Haddington	21,288	598	35.60	33.54	38.24	33.45	2,543	95	26.77	25.67	29.24	25.42	57,476	7,686	7.48	5.34	8.22	6.58
Inverness	109	5	21.80	17.67	22.75	20.28†	691	30	23.03	22.29	25.68	26.08	25,537	5,927	4.31	3.98	3.50	4.31
Kincardine	25,068	650	38.57	38.08	37.80	33.77	942	39	24.15	25.41	30.05	25.81	21,329	2,372	8.99	4.97	5.80	5.94
Kinross	1,788	49	36.49	35.14	36.00	32.11	..	..	..	32.00	..	—	8,892	588	6.62	4.44	6.81	5.58
Kirkcudbright	556	17	32.71	32.39	31.04	33.29	150	5	30.00	27.00	23.00	27.65	8,303	1,481	5.61	3.52	5.66	5.48
Lanark	24,077	733	32.85	30.10	31.88	32.20	762	28	27.21	25.87	32.68	28.42	34,184	4,163	8.21	5.26	8.20	6.67
Linlithgow	11,931	341	34.99	30.84	35.16	31.72	74	3	24.67	23.70	26.40	25.12	12,798	1,636	7.82	5.90	7.67	6.27
Nairn	..	..	..	24.00	..	—	44	2	22.00	22.17	24.65	22.08	1,515	324	4.68	3.61	5.60	4.45
Orkney	—	—	—	—	—	—	—	—	—	—	—	—	20,731	2,775	7.47	7.88	5.08	6.84
Peebles	..	..	..	..	..	26.42‡	379	16	23.69	23.60	24.93	23.35	2,531	369	6.86	5.30	7.64	6.25
Perth	79,783	2,125	37.54	36.68	33.24	31.52	2,682	78	34.88	31.42	28.41	26.60	92,952	12,885	7.51	4.52	6.90	5.96
Renfrew	9,611	252	38.14	38.31	39.82	40.45	1,059	29	36.52	34.25	40.40	37.51	23,978	2,946	8.14	4.41	7.38	6.53
Ross and Cromarty	443	24	18.46	19.00	23.58	24.45	704	36	19.56	20.88	24.38	25.09	24,917	7,523	3.31	3.78	3.36	4.07
Roxburgh	5,800	167	34.73	29.04	32.07	30.91	955	31	30.81	24.32	31.36	26.86	8,066	1,295	6.23	4.67	6.77	5.52
Selkirk	..	..	..	30.00	30.00	—	337	11	30.64	28.91	28.00	25.00	978	188	5.20	3.73	5.69	4.40
Shetland	..	..	..	..	..	..	..	..	..	..	..	..	12,658	3,121	4.06	4.36	3.30	4.22
Stirling	104,272	2,919	35.72	29.27	32.78	30.11	658	21	31.33	29.56	26.18	26.87	25,336	2,989	8.48	6.98	8.40	6.84
Sutherland	84	5	16.80	17.67	22.00	20.88§	243	16	15.19	17.50	21.27	21.18	7,240	1,677	4.32	3.85	3.28	4.15
Wigtown	6,167	190	32.46	29.22	29.98	29.27	245	8	30.62	29.00	27.17	30.43	6,727	1,842	5.01	3.81	3.72	4.64
Total	471,490	13,378*	35.26	32.30	33.33	31.47	32,137	1,262‖	25.47	24.96	25.97	24.18	841,870	126,362	6.66	4.55	6.20	5.56

* Exclusive of 31 acres in Aberdeen, 3 acres in Banff, and 5 acres in Orkney, the produce of which was picked green.
† Average of 7 years only. ‡ Average of 6 years only. § Average of 8 years only.
‖ Exclusive of 21 acres in Aberdeen, 4 acres in Banff, and 38 acres in Orkney, the produce of which was picked green.

TABLE No. 4.—ESTIMATED TOTAL PRODUCE of TURNIPS (including SWEDES) and MANGELS, ACREAGE and Estimated AVERAGE YIELD per Acre in the Year 1898, compared with the Estimated YIELD for the Years 1897 and 1896, and the AVERAGE of the Ten Years, 1888-97, in each COUNTY of SCOTLAND.

COUNTIES.	TURNIPS.						MANGELS.					
	Total Produce in 1898.	Acreage in 1898.	Average Yield per Acre.			Average of the Ten Years, 1888-97.	Total Produce in 1898.	Acreage in 1898.	Average Yield per Acre.			Average of the Ten Years, 1888-97.
			1898.	1897.	1896.				1898.	1897.	1896.	
	Tons.	Acres.	Tons.	Tons.	Tons.	Tons.	Tons.	Acres.	Tons.	Tons.	Tons.	Tons.
Aberdeen	1,391,098	89,854	15.48	16.23	15.69	14.85	55	8	6.87	12.20	9.67	10.78
Argyll	85,706	5,627	15.23	11.90	13.34	13.67	181	23	7.87	8.42	8.68	11.61
Ayr	129,399	7,061	18.33	15.93	20.20	17.20	8,666	466	18.60	15.34	19.38	17.13
Banff	404,716	22,093	18.32	16.24	17.03	14.72	37	2	18.50	14.41	15.20	14.32†
Berwick	391,158	29,294	14.84	16.60	18.40	16.23	3,132	186	16.84	18.81	22.23	18.36
Bute	25,427	1,460	17.42	16.29	15.92	16.64	152	12	12.67	10.29	12.00	13.26
Caithness	215,132	13,768	15.86	16.71	10.10	14.70	13	1	13.00	9.67	8.50	—
Clackmannan	8,531	795	10.73	12.68	13.47	12.02	10	1	10.00	11 00	11.00	12.14
Dumbarton	29,474	1,503	19.61	18.28	19.57	16.89	470	27	17.41	15.48	17.10	15.20
Dumfries	313,165	18,949	16.53	14.95	20.13	15.19	2,549	112	22.76	20.54	27.16	21.67
Edinburgh	209,685	11,774	17.80	19.41	19.32	18.23	433	24	18.04	15.85	17.80	14.19
Elgin or Moray	269,759	15,621	17.27	16.41	17.22	16.06	156	9	17.33	14.66	18.92	16.23
Fife	365,894	21,719	14.78	14.65	14.37	12.01	469	23	20.39	11.38	11.85	10.23
Forfar	554,916	33,970	16.34	16.16	17.00	16.43	1,785	77	23.18	22.14	22.05	20.30
Haddington	266,598	15,887	16.78	18.27	20.18	18.88	1,752	105	16.69	15.80	20.71	14.58
Inverness	116,333	10,592	10.98	11.86	11.81	11.97	96	9	10.67	13.00	14.00	17.02
Kincardine	270,208	17,846	15.14	15.18	16.01	14.84	44	3	14.67	..	15.00	—
Kinross	39,337	2,705	14.54	13.61	16.71	12.66	..	..	..	..	..	..
Kirkcudbright	237,118	12,854	18.45	17.15	21.22	16.61	808	40	20.20	18.81	20.89	15.41
Lanark	208,515	9,726	21.44	18.66	20.09	18.82	680	45	15.11	10.46	15.79	12.84
Linlithgow	65,588	3,885	16.88	16.78	18.50	16.88	58	4	14.50	14.25	15.57	11.86
Nairn	61,934	4,182	14.81	15.02	15.24	14.08	124	10	12.40	18.00	19.56	—
Orkney	132,671	14,485	9.16	9.98	7.05	9.82	—*	1	—*	—*	..	—
Peebles	69,053	4,081	16.92	16.21	18.01	16.66	28	2	14.00	..	..	—
Perth	462,303	29,040	15.92	16.26	14.16	14.59	323	24	13.46	10.10	8.44	10.74
Renfrew	43,186	2,325	18.57	15.16	18.66	16.54	515	30	17.17	13.49	17.55	15.20
Ross and Cromarty	164,584	16,146	10.19	11.24	10.89	11.54	166	14	11.86	12.89	13.20	18.81
Roxburgh	280,304	21,782	13.28	14.91	18.18	16.17	321	19	16.89	21.07	22.28	21.38
Selkirk	39,388	2,824	13.95	14.47	15.86	14.20	..	..	..	..	..	—
Shetland	20,718	1,305	15.88	17.38	11.57	13.86	..	..	..	..	—*	—
Stirling	63,878	4,510	14.16	14.94	15.79	15.12	171	12	14.25	13.91	14.64	13.17
Sutherland	29,252	3,035	9.64	10.23	9.52	11.00	..	..	..	..	..	—
Wigtown	267,530	15,789	16.94	15.86	16.26	14.15	2,408	130	18.52	18.77	19.12	15.84
Total	7,241,781	467,315	15.50	15.64	16.09	15.00	25,602	1,419	18.04	16.04	19.16	16.50

* Crop failed.

† Average of 9 years only.

TABLE No. 5.—ESTIMATED TOTAL PRODUCE OF HAY from Clover, Sainfoin, and Grasses under Rotation, also Total from Permanent Pasture, ACREAGE, and Estimated AVERAGE YIELD per Acre in the Year 1898, compared with the Estimated YIELD for the Years 1897 and 1896, and the AVERAGE of the Ten Years, 1888-97, in each COUNTY of SCOTLAND.

Counties.	From Clover, Sainfoin, and Grasses.						From Permanent Pasture.					
	Total Produce in 1898.	Acreage in 1898.	Average Yield per Acre.			Average of the Ten Years, 1888-97.	Total Produce in 1898.	Acreage in 1898.	Average Yield per Acre.			Average of the Ten Years, 1888-97.
			1898.	1897.	1896.				1898.	1897.	1896.	
	Cwt.	Acres.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Acres.	Cwt.	Cwt	Cwt.	Cwt.
Aberdeen	1,507,309	46,159	32.65	27.87	24.04	26.44	23,045	1,023	22.53	22.01	20.91	21.03
Argyll	352,241	11,235	31.35	28.54	31.11	29.28	394,670	13,285	29.71	27.53	31.59	28.92
Ayr	1,168,544	31,701	36.86	36.37	35.41	33.65	638,609	16,132	39.59	36.01	37.58	36.20
Banff	288,187	9,413	30.62	22.87	30.83	27.22	15,063	765	19.69	18.72	22.94	20.08
Berwick	299,673	9,563	31.34	31.01	30.09	33.50	31,743	1,307	24.29	23.18	23.60	28.35
Bute	84,022	2,186	38.44	34.90	37.46	34.70	13,808	430	32.11	31.01	30.90	29.41
Caithness	224,791	9,243	24.32	13.34	19.05	26.82	18,554	1,593	11.65	5.52	6.65	16.37
Clackmannan	71,046	1,779	39.94	39.65	38.78	35.29	18,622	600	31.04	29.03	27.37	29.63
Dumbarton	215,020	6,885	31.23	39.56	40.78	35.83	79,667	1,805	44.14	43.76	44.49	36.16
Dumfries	502,621	17,877	28.12	29.67	27.70	25.57	649,597	18,255	35.58	35.60	32.11	27.81
Edinburgh	763,642	13,049	58.52	60.42	59.47	47.59	64,383	1,839	35.01	33.70	35.19	33.89
Elgin or Moray	154,455	5,348	28.88	23.08	26.01	24.65	10,948	490	22.34	21.36	20.21	19.79
Fife	944,247	27,179	34.74	31.40	32.77	30.94	129,238	4,474	28.89	27.13	24.16	26.52
Forfar	750,725	19,686	38.13	38.86	40.15	34.16	39,090	1,944	20.11	21.02	23.30	25.52
Haddington	565,925	10,517	53.81	56.07	57.82	45.97	27,162	924	29.40	29.45	31.63	32.20
Inverness	236,127	11,518	20.50	17.84	22.38	18.74	104,401	5,114	20.41	11.24	12.28	12.12
Kincardine	405,284	12,659	32.02	28.36	29.67	27.84	4,665	190	24.55	20.09	19.91	19.02
Kinross	75,202	2,623	28.67	27.30	25.34	28.02	29,998	850	35.29	33.63	33.13	31.06
Kirkcudbright	282,570	8,977	31.48	29.73	25.05	26.99	340,290	12,482	27.26	24.76	24.38	25.88
Lanark	1,486,693	35,645	41.71	37.16	41.53	36.67	381,058	8,614	44.24	36.82	40.12	37.95
Linlithgow	400,056	7,338	54.52	51.59	55.82	42.07	23,171	776	29.86	29.33	31.57	31.31
Nairn	38,937	1,720	22.64	14.95	26.76	19.95	1,678	81	20.65	11.43	21.67	16.38
Orkney	139,024	7,353	18.91	15.41	26.53	21.19	2,834	304*	9.32	9.65	11.38	8.86
Peebles	68,602	2,053	33.42	30.54	33.95	29.94	44,871	1,563	28.71	4.02	30.80	27.97
Perth	855,669	29,998	28.52	25.88	35.34	32.08	225,655	9,681	23.31	24.27	24.63	25.25
Renfrew	580,029	14,467	40.09	40.72	42.44	38.32	242,062	5,008	48.38	45.23	50.07	43.84
Ross and Cromarty	260,084	14,085	18.46	18.81	21.28	20.68	15,993	2,009	7.96	7.85	9.67	10.34
Roxburgh	277,261	8,971	30.91	33.36	32.09	33.27	151,644	6,235	24.32	26.40	27.58	29.02
Selkirk	35,149	1,142	30.78	29.99	24.98	29.95	35,495	1,406	25.25	23.01	20.81	25.81
Shetland	14,499	751	19.31	20.49	21.26	25.86	23,846	1,519	15.70	17.57	16.46	16.08
Stirling	485,491	12,561	38.65	37.37	35.85	32.10	124,281	3,542	35.09	33.78	33.21	29.47
Sutherland	71,191	3,936	18.09	16.74	19.23	19.02	11,082	1,259	8.80	7.59	9.17	11.59
Wigtown	157,577	4,634	34.00	32.97	33.88	37.81	73,575	3,701	19.88	19.58	19.89	26.85
Total	13,761,848	402,251	34.21	32.13	33.44	31.06	3,990,592	129,195*	30.89	28.84	29.28	28.48

* This Acreage is less than that stated in some other Tables by 408 acres, which were originally returned for the county of Orkney as "Grass for Hay," but were subsequently stated to have been used for grazing.

TABLE No. 6.—NUMBER OF HORSES, CATTLE, SHEEP, AND PIGS IN EACH COUNTY OF SCOTLAND AS RETURNED ON JUNE 5, 1899.

Counties.	Horses (including Ponies).				Cattle.				Sheep.			Pigs.
	Used solely for Agriculture, &c.*	Unbroken Horses.		Total.	Cows and Heifers in Milk or in Calf.	Other Cattle.		Total.	1 Year Old and above.	Under 1 Year.	Total.	
		1 Year and above.	Under 1 Year.			2 Years and above.	Under 2 Years.					
1. Aberdeen	23,011	5,510	1,809	30,330	45,540	39,584	90,283	175,407	137,855	95,008	232,863	12,346
2. Argyll	4,601	1,317	449	6,367	22,888	13,052	25,758	61,698	674,332	300,472	984,804	4,285
3. Ayr	7,157	1,672	500	9,329	51,031	13,764	37,090	101,885	234,378	151,720	386,098	13,920
4. Banff	6,746	1,589	580	8,915	13,377	5,768	25,416	44,561	41,302	30,098	71,400	2,735
5. Berwick	4,458	794	197	5,449	3,119	4,899	8,814	16,832	161,813	154,145	315,958	3,796
6. Bute	1,040	159	78	1,277	3,857	1,680	4,214	9,751	31,705	16,192	47,897	621
7. Caithness	4,553	810	284	5,653	7,841	2,340	11,599	21,780	80,492	49,514	130,006	1,495
8. Clackmannan	527	132	40	699	1,522	805	1,359	3,686	8,694	5,752	14,446	1,729
9. Dumbarton	1,472	281	92	1,845	8,660	2,481	4,243	15,384	43,795	26,492	70,287	1,339
10. Dumfries	5,777	1,237	470	7,484	20,330	12,715	28,962	62,016	341,319	224,171	565,490	10,915
11. Edinburgh	3,852	499	127	4,478	12,537	3,904	5,009	21,450	112,123	79,280	191,403	8,194
12. Elgin	3,908	771	278	4,957	6,895	3,189	12,212	22,296	43,014	29,500	72,514	2,472
13. Fife	7,862	1,485	490	9,837	12,480	17,119	21,421	51,020	71,446	50,093	121,539	5,519
14. Forfar	8,457	1,145	426	10,028	12,536	17,707	21,425	51,668	101,257	65,962	167,219	6,743
15. Haddington	3,246	245	64	3,555	2,011	4,750	3,354	10,115	75,867	55,354	131,221	2,171
16. Inverness	7,118	1,156	678	8,952	22,362	6,867	23,092	52,321	429,416	199,279	628,695	2,069
17. Kincardine	4,066	669	274	5,009	6,970	5,453	13,329	25,752	26,852	17,631	44,483	2,544
18. Kinross	791	243	72	1,106	1,321	1,466	4,304	7,091	24,289	16,631	40,920	671
19. Kirkcudbright	4,041	1,088	347	5,476	16,246	12,073	21,220	49,539	248,243	151,095	399,338	8,265
20. Lanark	6,532	1,195	347	8,074	39,574	12,371	23,463	75,408	159,010	93,189	252,199	7,213
21. Linlithgow	1,634	374	115	2,123	4,936	2,829	4,474	12,239	17,891	8,585	26,476	1,996
22. Nairn	1,121	315	93	1,529	1,991	662	3,593	6,246	13,560	5,800	19,360	690
23. Orkney	5,336	1,042	461	6,839	9,858	3,377	15,193	28,428	18,636	18,200	36,836	2,586
24. Shetland	3,121	1,786	956	5,863	7,994	4,516	6,349	18,859	67,026	43,769	110,795	2,301
25. Peebles	915	138	45	1,098	2,204	1,374	3,920	7,498	117,009	84,529	201,538	618
26. Perth	10,216	1,960	552	12,728	18,501	18,236	38,991	75,728	497,017	249,848	746,865	7,594
27. Renfrew	2,696	503	115	3,314	17,452	2,845	6,516	26,813	26,137	16,447	42,584	1,458
28. Ross and Cromarty	6,139	1,428	526	8,093	18,126	7,315	18,524	43,965	217,106	109,038	326,144	4,790
29. Roxburgh	3,738	450	112	4,300	4,560	4,653	8,574	17,787	297,274	235,715	532,989	3,260
30. Selkirk	600	81	33	714	1,323	500	1,400	3,223	104,297	80,660	184,957	373
31. Stirling	3,627	873	272	4,772	12,181	8,664	13,057	33,902	76,533	46,051	122,584	2,096
32. Sutherland	2,241	334	110	2,685	5,814	1,712	4,525	12,051	142,269	66,271	208,540	815
33. Wigtown	4,354	1,157	455	5,966	23,743	8,314	18,721	50,778	80,022	47,010	127,032	12,020
Total	154,953	32,444	11,447	198,844	439,789	246,984	530,404	1,217,177	4,728,479	2,832,501	7,560,980	140,239

* Including Mares kept for breeding.

TABLE No. 7.—QUANTITY AND VALUE OF CORN, &c., imported into the United Kingdom in the undermentioned Years.

[*From Trade and Navigation Returns.*]

	Quantities.			Values.		
	1897.	1898.	1899.	1897.	1898.	1899.
Wheat from—	Cwt.	Cwt.	Cwt.	£	£	£
Russia	15,049,900	6,232,500	2,518,800	5,439,052	2,540,388	841,459
Germany	1,333,400	711,390	466,030	479,343	302,155	152,104
Turkey	1,862,540	271,560	27,300	658,697	98,893	8,110
Roumania	1,221,340	183,700	32,100	425,020	76,544	11,050
United States—						
On the Atlantic	24,969,800	30,561,000	28,315,948	9,620,110	12,325,090	9,690,331
On the Pacific	9,633,400	7,294,200	6,334,700	3,484,660	2,969,676	2,115,360
Chile	1,019,300	807,300	265,600	374,092	330,252	84,032
Argentine Republic	933,100	3,983,400	11,868,600	318,871	1,753,904	3,622,063
British East Indies	572,760	9,537,900	8,192,200	241,447	3,556,051	2,651,167
Australasia	..	211,620	3,703,030	..	79,762	1,247,744
British North America	4,820,500	5,012,030	5,256,500	1,875,058	1,948,147	1,801,953
Other countries	1,324,140	421,330	156,170	452,153	166,394	50,419
Total	62,740,180	65,227,930	66,636,978	23,363,503	26,147,256	22,282,701
Wheat and flour, from—						
Germany	73,745	107,340	60,707	30,933	51,878	25,861
France	1,682,420	438,160	641,888	834,292	229,371	275,081
Austrian territories	1,143,950	729,290	1,029,616	739,514	543,266	563,931
United States	14,062,970	17,445,890	18,405,796	7,089,094	9,470,433	8,568,884
British North America	1,530,690	1,988,200	2,498,920	803,389	1,057,927	1,154,246
Other countries	186,894	328,229	308,831	102,434	192,568	117,987
Total	18,680,669	21,017,109	22,945,708	9,599,656	11,545,443	10,700,990
Barley	18,958,720	24,457,004	17,189,358	4,081,074	6,791,472	4,960,332
Oats	16,116,810	15,577,900	15,626,630	4,038,813	4,382,857	4,199,724
Peas	2,820,135	2,179,192	2,752,950	771,055	689,769	898,951
Beans	2,840,050	2,293,346	1,877,220	762,275	670,159	573,891
Indian corn or maize	53,785,380	57,169,292	62,699,650	9,188,708	11,282,310	12,967,202
Indian corn meal	1,029,301	1,453,800	1,814,766	261,120	379,485	457,584
Other kinds of corn and meal	..	..	..	913,270	1,020,513	1,047,236
Total of corn, &c.	..	..	..	53,579,474	62,009,264	58,088,561

TABLE No. 8.—RETURN OF THE AVERAGE PRICES OF WOOL in the Years 1897 and 1898.

Years.	Australian.	South African.	British Fleeces.
	Per lb.	Per lb.	Per lb.
	s. d.	s. d.	s. d. s. d.
1897	0 8¼	0 7½	0 5¼ to 0 11½
1898	0 8½	0 7¼	0 5 " 0 10

TABLE No. 9.—QUANTITIES AND VALUES OF CORN, MEAT, FOOD PRODUCTS, in the Year 1899, with the

[*From Trade and*

	Quantities.			Values.		
	1897.	1898.	1899.	1897.	1898.	1899.
ANIMALS, LIVING:—	No.	No.	No.	£	£	£
Cattle	618,321	569,066	503,504	10,460,996	9,399,798	8,572,114
Sheep and lambs .	611,504	663,747	607,755	919,096	984,868	942,891
Swine	..	450	2	..	1,020	7
Total value .	..	..	..	11,380,092	10,385,676	9,515,012
CORN:—	Cwt.	Cwt.	Cwt.	£	£	£
Wheat . . .	62,740,180	65,227,930	66,686,978	23,363,503	26,147,256	22,282,701
Wheat meal and flour	18,680,669	21,017,100	22,945,708	9,599,656	11,545,448	10,700,990
Barley . . .	18,958,720	24,457,004	17,189,358	4,681,074	6,791,472	4,960,332
Oats	16,116,810	15,577,900	15,626,630	4,038,813	4,382,857	4,199,724
Peas	2,820,185	2,170,192	2,752,950	771,055	689,769	898,951
Beans . . .	2,840,050	2,293,346	1,877,220	762,275	670,159	573,891
Maize	53,785,380	57,169,292	62,699,650	9,188,708	11,282,310	12,967,202
Maize-meal . .	1,029,301	1,453,800	1,814,766	261,120	379,485	457,534
Other kinds of corn and meal	..	..	..	913,270	1,020,518	1,047,236
Total value .	..	..	..	53,579,474	62,909,264	58,088,561
MEAT:—	Cwt.	Cwt.	Cwt.	£	£	£
Beef, salted . .	174,936	208,945	178,183	215,901	273,004	230,943
" fresh . .	3,010,387	3,100,821	3,802,622	5,783,667	5,915,705	7,344,723
Mutton, fresh . .	3,193,276	3,314,001	3,446,022	4,827,868	4,902,179	5,439,407
Bacon	5,004,915	5,711,322	5,804,583	8,867,846	10,321,674	10,400,602
Hams	1,725,875	1,972,299	1,978,621	3,681,966	3,894,839	4,094,500
Pork, salted (not Hams)	237,206	275,993	284,720	258,698	319,778	305,829
Pork, fresh . .	347,617	557,602	668,972	765,128	1,165,380	1,403,041
Meat, unenumerated—salted or fresh	364,822	414,977	464,782	727,273	812,738	883,308
Meat preserved otherwise than by salting	669,684	574,937	652,424	1,702,315	1,802,440	1,896,738
Rabbits . . .	276,458	314,398	377,291	548,494	572,608	638,655
Total of dead meat	15,005,176	16,445,295	17,658,220	27,369,151	29,980,340	32,637,796
DAIRY PRODUCE:—	Cwt.	Cwt.	Cwt.	£	£	£
Butter . . .	3,217,802	3,209,153	3,389,851	15,916,917	15,961,783	17,213,516
Margarine . . .	936,543	900,615	953,175	2,485,370	2,384,384	2,549,376
Cheese . . .	2,603,178	2,339,452	2,389,313	5,885,521	4,970,242	5,515,091
Total .	6,757,523	6,449,220	6,732,339	24,287,808	23,316,409	25,277,983
POULTRY, &c.:—				£	£	£
Poultry and game, alive or dead	..	..	..	730,725	637,492	785,294
	Gt. Hunds.	Gt. Hunds.	Gt. Hunds.			
Eggs	14,031,754	14,424,601	16,174,760	4,356,807	4,457,117	5,044,392
Total value .	..	..	..	5,087,532	5,094,609	5,829,686

AND ARTICLES AFFECTING AGRICULTURE, imported into the United Kingdom Corresponding Figures for 1897 and 1898.

Navigation Returns.]

	Quantities.			Values.		
	1897.	1898.	1899.	1897.	1898.	1899.
FRUIT, VEGETABLES, &c.:—						
Apples . . .	Bushels. 4,199,971	Bushels. 3,458,716	Bushels. 3,861,172	£ 1,187,308	£ 1,108,056	£ 1,186,143
Cherries . . .	312,294	401,810	281,236	178,131	230,828	153,642
Plums . . .	1,043,819	922,248	558,273	497,783	434,666	294,052
Pears	1,051,877	491,669	581,832	377,900	221,779	266,351
Grapes . . .	993,718	1,135,759	1,158,215	495,017	549,513	588,684
Oranges and lemons .	10,346,121	8,905,956	10,238,429	2,677,070	2,426,245	2,634,230
Unenumerated . .	1,725,116	2,177,132	2,248,268	695,159	870,711	925,470
Onions . . .	6,108,924	6,002,515	7,008,298	760,560	792,909	845,752
Potatoes . . .	Cwt. 3,921,205	Cwt. 6,751,728	Cwt. 5,157,811	1,200,328	1,913,912	1,577,519
Vegetables, unenumerated (raw)	..	..	..	1,456,701	1,680,786	1,744,068
Hops	164,154	244,136	180,233	524,297	1,030,140	809,842
Total value .	..	..	..	10,050,249	11,259,545	11,025,783
OTHER ARTICLES:—						
Lard	Cwt. 1,740,468	Cwt. 2,106,871	Cwt. 2,188,049	£ 1,993,143	£ 2,887,801	£ 3,068,985
Wool, sheep and lambs'	Lb. 735,627,420	Lb. 689,446,139	Lb. 659,408,683	24,436,871	23,437,188	23,579,769
Wood and timber— Hewn . . .	Loads. 2,825,665	Loads. 2,331,755	Loads. 2,667,049	5,780,639	4,890,639	5,327,292
Sawn or split, planed or dressed	7,024,492	6,363,357	6,635,754	16,639,931	15,056,040	16,201,172
Staves . . .	126,745	139,120	126,216	569,572	646,075	659,342
Oilseed cake . .	Tons. 336,898	Tons. 390,758	Tons. 441,933	1,834,729	2,284,244	2,649,189
Seeds— Clover and grass .	Cwt. 299,946	Cwt. 342,773	Cwt. 209,268	579,258	655,211	549,535
Cotton . . .	Tons. 412,876	Tons. 430,432	Tons. 357,952	1,925,351	2,069,111	2,036,550
Flax and linseed .	Qrs. 1,908,618	Qrs. 1,688,515	Qrs. 1,798,887	2,988,503	2,920,684	3,383,962
Rape	185,232	258,951	207,648	258,233	367,736	307,058
Bones (whether burnt or not) . . .	Tons. 59,228	Tons. 59,406	Tons. 67,915	217,592	245,639	313,659
Guano . . .	16,734	23,644	26,911	89,812	117,924	140,075
Cotton, raw . .	Cwt. 15,394,289	Cwt. 19,004,896	Cwt. 14,520,391	32,195,172	34,125,554	27,678,089
Hemp . . .	Tons. 89,019	Tons. 94,442	Tons. 91,973	1,763,402	2,308,480	2,668,547
Flax	98,802	97,253	99,052	3,203,184	2,932,646	2,927,355
Hides untanned— Dry	Cwt. 557,087	Cwt. 543,212	Cwt. 446,285	1,413,166	1,454,935	1,148,652
Wet	638,668	694,154	764,240	1,336,991	1,451,029	1,641,514
Petroleum . . .	Gallons 185,665,376	Gallons. 219,249,539	Gallons. 39,922,681	3,335,271	3,733,632	4,572,789

TABLE No. 10.—QUANTITY AND VALUE OF DEAD MEAT imported into the United Kingdom in the undermentioned Years.

[*From Trade and Navigation Returns*]

	Quantities			Values.		
	1897.	1898.	1899.	1897.	1898.	1899.
BACON, from—	Cwt.	Cwt	Cwt	£	£	£
Denmark . . .	1,026,552	1,017,520	1,210,612	2,744,480	2,701,112	2,945,757
Canada . . .	290,283	535,879	453,773	523,195	995,625	761,861
United States . .	3,592,635	4,087,389	4,088,546	5,353,624	6,438,239	6,552,180
Other countries . .	95,445	70,534	51,652	246,597	186,698	140,804
Total . .	5,004,915	5,711,322	5,804,583	8,867,846	10,321,674	10,400,602
BEEF (salted), from—						
United States . .	171,970	203,645	175,056	212,184	266,660	226,842
Other countries .	2 966	5,300	3,127	3,717	6,344	4,101
Total .	174,936	208,945	178,183	215,901	273,004	230,943
BEEF (fresh), from—						
United States . .	2,242,063	2,301,956	2,756,796	4,609,130	4,677,431	5,712,251
Australia . . .	634,255	624,407	743,643	937,189	953,338	1,124,912
Other countries . .	134,069	174,458	302,183	237,348	284,936	507,560
Total . .	3,010,387	3,100,821	3 802,622	5,783,667	5,915,705	7,344,723
HAMS, from—						
Canada . . .	119,133	117,428	150,698	260,272	233,272	301,212
United States . .	1,603,533	1,851,520	1,823,965	3,411,559	3,651,414	3,781,007
Other countries . .	3,209	3,351	3,958	10,135	10,153	12,281
Total . .	1,725,875	1,972,299	1,978,621	3,681,966	3,894,839	4,094,500
MEAT (unenumerated, salted or fresh), from—						
Holland . . .	224,635	249,939	254,001	471,958	517,507	526,271
United States . .	76,103	90,412	123,423	126,714	156,706	214,283
Other countries .	64,085	74,626	87,358	128,601	138,525	142,809
Total . .	364,822	414,977	464,782	727,273	812,738	883,363
MEAT, preserved otherwise than by salting—						
Beef	372,687	281,344	366,319	1,000,180	1,017,480	1,064,501
Mutton . . .	99,022	118,314	87,327	161,478	195,249	156,139
Other sorts . .	197,975	174,279	198,778	540,657	589,711	676,098
Total . .	669,684	574,937	652,424	1,702,315	1,802,440	1,896,733
MUTTON (fresh), from—						
Germany . . .	2,321	1,270	608	5,764	2,815	1,503
Holland . . .	266,842	265,543	284,886	592,264	584,779	629,040
Australasia .	2,009,085	1,934,108	2,001,452	3,040,269	2,940,698	3,271,976
Argentine Republic .	908,623	1,106,201	1,141,208	1,175,129	1,357,926	1,490,166
Other countries . .	6,405	6,879	17,868	14,442	15,961	43,722
Total .	3,193,276	3,314,001	3,446,022	4,827,868	4,902,179	5,439,407
PORK (salted, not Hams), from—						
United States . .	141,428	175,000	164,042	167,500	224,534	199,850
Other countries . .	95,778	100,093	120,678	86,193	95,244	105,979
Total . .	237,206	275,093	284,720	253,693	319,778	305,829
PORK (fresh), from—						
Holland . . .	226,215	222,672	344,346	488,755	474,462	727,637
Belgium . .	36,832	35,102	35,342	92,570	88,258	91,996
Other countries .	84,570	299,828	289,284	183,803	602,660	588,408
Total .	347,617	557,602	668,972	765,128	1,165,380	1,408,041
RABBITS, from—						
Belgium . . .	84,430	84,505	80,988	227,192	228,876	216,658
Australia . . .	167,932	204,933	266,523	250,720	275,235	342,121
Other countries . .	24,096	24,960	29,785	65,582	68,492	79,876
Total . .	276,458	314,398	377,291	543,494	572,608	638,655
Total of dead meat	15,005,176	16,445,295	17,658,220	27,369,151	29,980,340	32,637,796

TABLE No. 11.—QUANTITIES AND VALUES OF BUTTER, MARGARINE, CHEESE, AND EGGS imported into the United Kingdom in each Year from 1897 to 1899 inclusive.

[*From Trade and Navigation Returns.*]

	Quantities.			Values.		
	1897.	1898.	1899.	1897.	1898.	1899.
BUTTER from—	Cwt.	Cwt.	Cwt.	£	£	£
Sweden . .	299,214	294,962	245,599	1,515,705	1,501,668	1,246,137
Denmark .	1,334,726	1,465,030	1,430,052	6,748,163	7,359,831	7,553,436
Germany .	51,761	41,231	36,953	263,097	214,046	186,573
Holland . .	278,631	269,324	284,810	1,353,349	1,329,438	1,417,641
France . .	448,128	416,821	353,942	2,330,576	2,183,845	1,908,848
New S. Wales	23,835	34,391	43,561	112,218	167,618	215,274
Victoria . .	169,075	124,223	211,744	816,399	605,611	1,051,358
New Zealand .	76,522	69,949	111,639	366,956	338,400	543,367
Canada . .	109,402	156,865	250,083	444,862	661,935	1,113,956
United States .	154,196	66,712	159,137	633,549	285,309	704,061
Other countries	272,312	269,645	262,331	1,332,043	1,314,082	1,272,865
Total .	3,217,802	3,209,153	3,389,851	15,916,917	15,961,783	17,213,516
MARGARINE from—	Cwt.	Cwt.	Cwt.	£	£	£
Norway . .	10,827	8,477	8,278	29,785	22,799	22,654
Holland . .	872,473	844,177	897,806	2,291,796	2,209,809	2,378,944
France . .	30,563	30,299	27,721	106,105	105,309	96,250
Other countries	22,680	17,662	19,370	57,684	46,467	51,528
Total .	936,543	900,615	953,175	2,485,370	2,384,384	2,549,376
CHEESE from—	Cwt.	Cwt.	Cwt.	£	£	£
Holland . .	297,604	292,925	328,585	748,251	724,936	810,102
France . .	36,358	33,086	34,307	110,087	94,102	103,159
Australasia .	68,615	44,608	37,494	161,776	91,161	84,318
Canada . .	1,526,664	1,432,181	1,337,198	3,349,501	2,943,725	3,014,211
United States .	631,616	485,995	590,737	1,413,079	1,006,586	1,380,609
Other countries	42,321	50,657	60,992	102,827	109,732	122,692
Total .	2,603,178	2,339,452	2,389,313	5,885,521	4,970,242	5,515,091
EGGS from—	Great Hundreds.	Great Hundreds.	Great Hundreds.	£	£	£
Russia . .	3,132,333	3,645,903	4,318,601	812,297	966,129	1,183,031
Denmark .	1,748,800	2,019,508	2,266,030	596,282	685,447	808,543
Germany .	2,971,846	2,821,128	3,454,986	813,022	788,844	966,641
Belgium . .	2,464,182	2,349,962	2,457,558	768,077	780,898	759,250
France . .	2,675,667	2,115,096	2,288,562	1,022,869	817,336	867,865
Canada . .	568,769	745,355	646,867	193,998	251,710	233,693
Other countries	470,157	727,649	742,156	150,262	216,753	225,369
Total .	14,031,754	14,424,601	16,174,760	4,356,807	4,457,117	5,044,392

TABLE No. 12.—PRICES OF LIVE STOCK IN 1896, 1897, AND 1898, as returned under the Markets and Fairs (Weighing of Cattle) Act, 1891.

[*From Journal of the Board of Agriculture.*]

NUMBER OF ANIMALS REPORTED AS ENTERING THE 19 SCHEDULED PLACES IN GREAT BRITAIN, TOGETHER WITH THE NUMBERS WEIGHED AND THE NUMBERS PRICED.

ANIMALS.	1898.*	1897.	1896.
CATTLE :—	No.	No.	No.
Entering markets	1,263,991	1,115,183	1,100,014
Weighed	138,652	111,767	109,184
Prices returned	124,197	100,371	99,537
Prices returned with breed and quality distinguished	102,299	78,329	75,014
SHEEP :—			
Entering markets	4,691,619	4,194,310	4,309,943
Weighed	49,953	41,969	41,685
Prices returned with breed and quality distinguished	40,460	36,692	35,048
SWINE :—			
Entering markets	363,370	211,613	232,344
Weighed	1,614	2,333	4,585
Prices returned	1,437	1,368	1,686
Prices returned with breed and quality distinguished	1,437	1,368	1,686

CALCULATED AVERAGE PRICE PER LIVE CWT. IN TWELVE SELECTED PLACES.

(*Obtained by dividing the total price by the total weight of the weighed animals of all descriptions in each of the three qualities or grades.*)

PLACES.	Inferior or third quality.				Good or second quality.				Prime or first quality.			
	1898.		1897.		1898.		1897.		1898.		1897.	
	Per cwt. s.	d.	Per cwt. s.	d.	Per cwt. s.	d.	Per cwt. s.	d.	Per cwt. s.	d.	Per cwt. s.	d.
ENGLAND :—												
Carlisle	25	10	...		29	10	...		32	10	...	
Leeds	28	0	27	8	29	4	30	4	32	0	32	4
Liverpool	24	0	25	10	28	0	30	0	31	10	32	8
London	25	2	28	4	32	4	33	8	36	6	38	10
Newcastle	26	0	27	2	29	10	30	8	33	4	36	2
Shrewsbury	24	6	25	4	29	8	30	6	34	2	34	6
SCOTLAND :—												
Aberdeen	23	10	24	8	31	8	33	0	34	8	36	0
Dundee	26	10	27	6	31	4	32	6	33	8	35	2
Edinburgh	28	10	...		32	8	33	10	34	0	35	8
Falkirk	28	2	...		31	10	...		34	0	...	
Glasgow	31	0	30	8	32	2	32	10	33	10	35	10
Perth	30	2	31	4	32	4	33	10	34	8	35	10

* Includes the returns from Carlisle and Falkirk.

TABLE No. 13.—NUMBER AND VALUE OF LIVE CATTLE, SHEEP AND SWINE imported into the United Kingdom in the undermentioned Years. [*From Trade and Navigation Returns.*]

—	Number.			Value.		
	1897.	1898.	1899.	1897.	1898.	1899.
CATTLE, from—				£	£	£
Channel Islands	1,633	1,814	1,732	31,048	34,785	33,101
Canada	126,495	108,406	94,660	2,045,209	1,774,760	1,596,007
United States	416,299	369,478	321,229	7,230,854	6,238,984	5,541,781
Argentine Republic	78,852	89,368	85,365	1,153,507	1,351,264	1,392,599
Other countries	42	..	518	378	..	8,536
Total	618,321	569,066	503,504	10,460,996	9,390,793	8,572,114
SHEEP AND LAMBS, from—						
Canada	63,761	42,070	63,930	95,602	63,286	100,320
United States	186,755	147,021	121,030	272,421	219,706	184,446
Argentine Republic	345,217	430,073	382,080	528,607	637,388	598,436
Other countries	15,771	44,583	40,715	22,466	64,483	59,689
Total	611,504	663,747	607,755	919,096	984,863	942,891
SWINE (not separately enumerated)	..	450	2	..	1,020	7
TOTAL VALUE OF ANIMALS LIVING	..	..	..	11,380,092	10,385,676	9,515,012

TABLE No. 14.—NUMBER OF HORSES, CATTLE, SHEEP, AND PIGS imported into Great Britain from Ireland in each of the Years 1893-99.

	1893.	1894.	1895.	1896.	1897.	1898.	1899.
HORSES:—							
Stallions	151	163	188	191	153	150	122
Mares	13,356	14,484	15,370	18,046	17,590	18,200	19,538
Geldings	16,883	18,942	19,002	21,619	20,679	20,454	22,562
Total	30,390	33,589	34,560	39,856	38,422	38,804	42,222
CATTLE: Oxen, Bulls, and Cows—							
Fat	316,344	330,748	302,555	274,472	259,173	278,770	278,220
Store	318,545	422,534	414,859	349,800	419,302	460,903	443,456
Other cattle	8,473	7,805	5,622	3,837	5,043	4,101	6,219
Calves	45,307	65,867	68,571	53,451	62,494	59,588	45,099
Total	688,669	826,954	791,607	681,560	746,012	803,362	772,994
SHEEP:—							
Sheep	705,299	574,471	351,975	397,164	435,709	449,558	452,214
Lambs	402,661	382,630	300,603	340,142	368,806	383,900	423,664
Total	1,107,960	957,101	652,578	737,306	804,515	833,458	875,878
PIGS:—							
Fat	405,242	515,647	500,700	574,677	653,459	556,723	650,850
Store	51,329	69,320	46,520	35,912	41,848	32,062	37,710
Total	456,571	584,967	547,220	610,589	695,307	588,785	688,560

EDINBURGH CORN-MARKET GRAIN TABLES for WHEAT, BARLEY, OATS, and BEANS, showing the Quantity offered for Sale, the Quantity Sold, the Highest, Lowest, and Average Prices; also the Bushel-weights of the Highest and Lowest Prices of each kind of Grain for every Market-day, likewise the Results for every Month, and the final Result for the year 1899.

WHEAT.

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.	Lowest Price.	Average Price.	Table of Bushel-weights for Highest Price.		Table of Bushel-weights for Lowest Price.	
1899	Imp. qr.	Imp. qr.	s. d.	s. d.	s. d.	lb.	lb.	lb.	lb.
Jan.									
4	1,297	855	30 0	26 3	28 2		65½		61
11	1,243	798	29 0	24 0	27 9		63		57
18	828	528	29 0	23 0	27 4		64¾		59
25	699	678	28 9	25 0	27 6		65		63
	4,067	2,854	29 1	25 2	27 9				
Feb.									
1	756	694	29 0	25 6	28 2		63		61½
8	1,264	1,005	28 6	25 6	27 6		63		63
15	1,353	794	29 6	24 0	26 7		64		63
22	1,094	736	27 9	24 0	25 11		63		63
	4,467	3,229	28 5	24 8	27 1				
March									
1	958	910	26 6	23 6	25 10	63	64		63
8	596	468	27 0	24 0	25 7		63½		63
15	401	260	26 9	23 6	25 10		63		63
22	466	404	26 6	24 6	25 6		64½		63
29	655	511	27 0	24 6	25 9		63½		63
	3,076	2,553	26 8	24 4	25 9				
April									
5	385	207	25 6	22 0	24 11	62	64		55
12	326	276	26 6	24 6	25 9		63	62	63
19	115	95	27 0	26 6	26 9	63	64		63
26	625	425	27 0	26 0	26 7		63		62
	1,451	1,003	26 5	25 2	26 0				
May									
3	1,322	882	26 6	25 6	26 2	62	64	62	63
10	909	909	26 6	20 0	25 9		63½		58½
17	2,028	1,071	26 3	21 0	25 3		63¾		58½
24	1,039	716	26 6	25 3	26 0		65½	62	63
31	792	733	27 0	22 6	26 5		63		56
	6,090	4,911	26 9	24 9	25 9				
June									
7	1,120	855	27 0	25 0	26 5		63		62½
14	1,564	1,553	27 0	24 6	26 4	63¾	64¼		63
21	1,809	1,631	28 0	24 6	26 2		66		60
28	2,167	1,433	27 3	21 0	25 7		64½		58½
	6,660	5,472	27 2	24 4	26 1				
July									
5	1,226	746	26 9	24 6	26 1	63	64½		63
12	2,090	1,516	27 3	22 0	25 8		66½		63
19	1,086	866	26 6	25 0	25 7		63		63
26	668	608	26 6	25 0	25 8		63	63	64
	5,070	3,736	26 9	24 10	25 9				

WHEAT—*continued.*

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.	Lowest Price.	Average Price.	Table of Bushel-weights for Highest Price.		Table of Bushel-weights for Lowest Price.	
1899	Imp. qr.	Imp. qr.	s. d.	s. d.	s. d.	lb.	lb.	lb.	lb.
Aug.									
2	957	752	26 0	24 0	25 4		64		63
9	2,270	1,905	26 3	23 0	25 2		65		61
16	2,234	1,761	26 0	21 6	25 1		63		60¼
23	1,486	935	25 9	24 6	25 4		63½		62¾
30	487	117	26 0	24 3	25 5		63		63
	7,434	5,470	26 0	23 10	25 2				
Sept.									
6	675	364	25 6	24 6	25 1	68	64		63
13	1,077	656	25 6	24 0	24 10		64		63
20	991	792	26 6	24 0	24 11		65½		63
27	1,124	860	26 6	25 0	25 8		65		63
	3,867	2,672	25 11	24 6	25 2				
Oct.									
4	506	298	30 0	21 6	26 7		63		57
11	853	636	32 0	25 0	28 5		63		63
18	1,011	629	34 6	22 10	28 11		64½		59
25	1,842	718	36 0	26 0	30 4		62		63
	4,212	2,281	34 8	24 0	28 11				
Nov.									
1	1,529	818	36 0	21 6	28 3		62		58½
8	1,045	236	31 0	22 0	27 6	63	64½		57
15	819	230	31 0	22 6	26 6		63		61
22	748	215	27 6	23 0	25 2		63		62
29	553	208	26 6	24 6	25 1		63	61	63
	4,694	1,707	29 11	24 0	27 2				
Dec.									
6	163	55	27 0	25 6	26 5		63		63
13	385	355	27 0	23 0	26 5		63		62
20	332	215	27 6	25 0	26 3		64		63
27	265	238	28 6	24 0	27 0		63		63
	1,145	863	27 3	24 6	26 7				
Result for year	52,238	36,751	27 1	24 6	26 3				

BARLEY.

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.	Lowest Price.	Average Price.	Highest lb.	Highest lb.	Lowest lb.	Lowest lb.
1899									
Jan.									
4	1,845	964	30 0	24 6	28 7	56	57		54½
11	2,183	1,361	32 0	24 6	28 5		56		53
18	2,332	1,549	30 6	25 0	28 2	56	58	55	56
25	1,869	915	30 0	24 6	27 9		56		56
	8,229	4,789	30 6	24 8	28 3				
Feb.									
1	1,780	1,085	30 6	26 6	27 11		56		56
8	2,970	1,826	31 3	24 0	27 8		56½		56
15	2,123	1,005	29 0	24 0	26 7	56	56½		56
22	2,170	526	29 6	24 6	26 7		57½		56
	9,043	4,532	30 0	25 6	27 4				

Barley—*continued.*

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.	Lowest Price.	Average Price.	Table of Bushel-weights for Highest Price.	Table of Bushel-weights for Lowest Price.
1899	Imp. qr.	Imp. qr.	s. d.	s. d.	s. d.	lb. lb.	lb. lb.
March							
1	2,013	899	28 0	24 0	25 10	56 57	56
8	1,734	633	32 0	22 6	25 10	56	56
15	2,093	770	29 0	23 0	26 5	56	56
22	2,209	956	28 0	23 0	25 11	56	53½
29	1,625	750	28 6	24 0	25 5	56	56
	9,674	4,008	28 7	23 6	25 11		
April							
5	1,341	624	29 0	24 0	25 8	56	56½
12	737	398	28 0	24 0	25 9	56	56
19	811	511	27 6	23 0	26 0	56	56
26	773	564	27 9	24 6	26 8	56	56
	3,662	2,097	27 9	23 8	26 1		
May							
3	593	266	28 0	25 0	26 6	56	56
10	926	512	28 0	24 3	26 5	56	56
17	656	523	28 0	23 6	26 3	56	56
24	208	78	26 3	23 0	25 6	56	56
31	27	22	26 3	24 0	25 3	56	55½
	2,410	1,401	27 7	23 9	26 4		
June							
7	..	..	..	..	..	..	..
14	198	75	27 0	25 6	26 5	56½ 57½	56
21	145	79	26 3	25 6	25 11	56	56
28	199	85	26 6	25 0	25 7	56	56
	542	239	26 8	25 3	25 11		
July							
5	170	170	25 9	25 0	25 5	56	56
12	14	..	..	..	..	..	..
19	55	20	26 0	..	26 0	56½	..
26	29	..	..	..	..	..	..
	268	190	25 10	25 0	25 6		
Aug.							
2	24	..	..	..	..	..	.
9	..	..	..	..	..	..	..
16	..	..	..	..	..	..	..
23	400	300	30 0	26 6	29 0	56	56
30	602	372	28 0	25 0	26 10	57½	56¾
	1,026	672	29 6	25 8	27 10		
Sept.							
6	1,058	933	28 6	24 0	26 9	56	55 56
13	2,610	1,458	29 6	23 6	26 7	56	56
20	2,362	1,694	29 0	22 9	26 2	56½	53
27	2,019	1,694	29 0	23 0	26 9	56	56
	8,049	5,779	29 1	23 5	26 7		
Oct.							
4	965	665	29 6	22 9	27 2	56	53
11	2,369	1,272	31 0	25 0	27 5	56	56
18	2,262	984	29 0	25 0	27 7	56	55
25	2,523	1,294	29 6	25 0	27 3	58	55
	8,119	4,215	29 6	24 8	27 4		

BARLEY—*continued.*

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.		Lowest Price.		Average Price.		Table of Bushel-weights for Highest Price.		Table of Bushel-weights for Lowest Price.	
1899	Imp. qr.	Imp. qr.	s	d.	s.	d.	s.	d.	lb.	lb.	lb.	lb.
Nov.												
1	2,950	1,439	28	0	22	0	26	5		56		51½
8	2,387	1,209	28	0	24	0	26	6		56	54	55
15	1,705	1,042	28	6	22	0	25	11		56		53½
22	2,167	1,552	28	0	21	6	26	0		56		52
29	1,343	1,056	28	6	22	0	26	7		56		52
	10,552	6,298	28	1	23	3	26	3				
Dec.												
6	1,643	1,252	29	0	23	6	27	3		56		53
13	2,149	1,622	29	6	22	6	27	7		56		54
20	2,395	1,268	30	0	24	9	27	4		56		54
27	1,917	1,226	30	0	24	6	27	9		56		55
	8,104	5,368	29	6	23	9	27	6				
Result for year	69,678	39,588	28	9	24	5	26	11				

OATS.

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.		Lowest Price.		Average Price.		Highest Price.		Lowest Price.	
1899												
Jan.												
4	2,329	1,405	21	3	16	0	19	4		46		40
11	3,041	2,268	21	0	15	9	19	2		45½		40
18	3,087	1,787	22	0	17	0	19	4		44½		41
25	2,960	1,586	22	0	16	0	19	2	44½	45		40
	11,417	7,046	21	9	16	1	19	3				
Feb.												
1	4,515	2,412	22	6	16	0	19	4		45½		42
8	4,674	2,488	21	6	16	0	19	0		44½		37¾
15	4,377	1,738	23	0	16	0	19	2		46½	41½	42
22	4,159	1,661	23	0	17	0	19	7		44½		41
	17,725	8,299	22	5	16	2	19	3				
March												
1	4,601	1,712	22	6	16	6	19	0		44½		41
8	5,458	2,816	23	0	15	6	19	0		44½		39½
15	4,148	1,205	23	0	15	0	19	3		44½		38
22	3,927	1,703	21	3	16	0	18	8	44½	45½		41½
29	3,217	1,505	22	0	14	0	18	11	45½	46½		42
	21,351	8,941	22	1	15	9	19	0				
April												
5	2,394	1,027	21	0	16	6	18	11		45½		42
12	3,355	1,340	21	0	17	6	19	2	44½	46		42½
19	2,570	1,753	21	6	17	9	19	11		44½	41	42
26	3,041	1,409	21	9	18	6	19	8		44½	42	43½
	11,360	5,529	21	4	18	0	19	6				
May												
3	3,518	1,213	21	9	18	0	20	1		46	41	41¾
10	2,693	1,824	21	6	17	9	20	3	45	45½		40
17	2,907	1,256	22	0	18	0	19	11		46		42
24	3,200	1,442	21	0	18	3	19	6		45	41¾	42
31	2,261	808	21	9	18	0	20	0		46		42
	14,579	6,543	21	7	18	1	20	0				

OATS—*continued.*

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.		Lowest Price.		Average Price.		Table of Bushel-weights for Highest Price.		Table of Bushel-weights for Lowest Price.	
1899 June	Imp. qr.	Imp. qr.	s.	d.	s.	d.	s.	d.	lb.	lb.	lb.	lb.
7	1,590	498	21	0	18	3	19	9	44½	46		42
14	2,087	936	21	0	17	6	19	2		45½		42
21	1,836	636	21	0	17	9	19	10	44½	45½		42
28	1,620	783	21	6	18	0	19	7		44½		42
	6,623	2,853	21	1	17	10	19	6				
July												
5	1,739	489	21	3	18	0	19	4		45½		42
12	1,313	970	21	3	17	6	19	2	45	45½	40	43
19	836	453	21	9	18	0	19	3		44½		42
26	1,088	739	21	6	18	3	20	0		44½		42
	4,976	2,651	21	5	17	10	19	5				
Aug.												
2	1,184	540	21	3	18	6	20	1		44¾		42
9	1,760	815	21	0	18	6	19	11	44½	45½		42
16	2,237	1,284	21	6	17	6	19	11		45		42
23	2,398	1,063	23	6	18	0	20	1		44		42
30	2,169	1,397	22	3	17	0	19	5		44		42
	9,748	5,099	21	4	18	1	19	10				
Sept.												
6	1,758	1,164	22	0	16	6	19	3		45		42
13	2,182	1,153	22	0	15	0	19	3	43	44½		37½
20	1,586	1,391	23	0	18	0	19	11		44½		42
27	1,372	1,049	22	6	18	0	19	9	44½	45		42
	6,898	4,757	22	3	17	2	19	7				
Oct.												
4	2,475	1,266	23	6	18	6	20	9		46½	39½	42
11	3,222	1,804	24	0	18	0	20	4		46½	40	41
18	2,469	1,437	23	0	17	0	19	11		44½		40
25	2,654	1,017	23	3	18	0	20	2		44½		41
	10,820	5,524	23	5	17	10	20	4				
Nov.												
1	2,641	1,222	23	0	17	0	19	8		44½		39¼
8	2,645	1,178	22	0	14	0	19	2		45½	36	37
15	2,991	1,058	22	6	16	0	19	7		45½		41
22	2,769	1,040	21	6	15	6	19	0		44½		38
29	2,207	789	21	0	17	3	19	0		44½		40½
	13,253	5,287	21	11	15	2	19	4				
Dec.												
6	2,525	1,190	21	3	15	6	18	7		45		42
13	2,498	1,398	20	9	15	0	18	4		44½		41
20	2,780	1,717	21	6	16	6	19	0	45¼	45½	40	42
27	1,946	962	21	6	17	0	18	9		44½		42
	9,740	5,267	21	3	16	4	18	8				
Result for year	138,499	67,796	21	8	17	4	19	5				

BEANS.

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.	Lowest Price.	Average Price.	Table of Bushel-weights for Highest Price.		Table of Bushel-weights for Lowest Price.	
1899 Jan.	Imp. qr.	Imp. qr.	s. d.	s. d.	s. d.	lb.	lb.	lb.	lb.
4	46	46	30 0	29 3	29 9		65½		63
11	96	86	32 0	28 0	30 11		63		62½
18	60	50	30 0	..	30 0		64½		..
25	25	25	31 6	28 6	29 8		63		62
	227	207	30 3	28 9	30 3				
Feb.									
1	139	79	30 6	27 6	29 1		65½		60½
8	131	100	30 6	30 0	30 2		65½	63	65½
15	161	132	34 6	29 0	30 6		63½		63
22	227	100	31 0	29 0	30 1	66¼	66½		63
	658	411	30 9	29 3	30 1				
March									
1	149	95	34 0	26 6	30 10		65½		63
8	237	16	30 6	..	30 6		63½		..
15	121	53	30 0	28 0	29 8		64		64
22	57	20	31 0	29 3	30 8		64		63
29	116	54	29 0	28 0	28 6		63½		63
	680	238	30 6	28 0	29 11				
April									
5	60	30	29 6	29 0	29 4		64		64
12	17	..	..	..	..		..		..
19	..	..	..	..	..		..		..
26	14	14	28 0	..	28 0		63		..
	91	44	28 10	29 0	28 11				
May									
3	..	..	..	..	..		..		..
10	..	..	..	..	..		..		..
17	..	..	..	..	..		..		..
24	50	..	..	..	..		..		..
31	..	..	..	..	..		..		..
	50	..	..	..	..				
June									
7	..	..	..	..	..		..		..
14	..	..	..	..	..		..		..
21	7	..	..	..	..		..		..
28	..	..	..	..	..		..		..
	7	..	..	..	..				
July									
5	..	..	..	..	..		..		..
12	..	..	..	..	..		..		..
19	..	..	..	..	..		..		..
26	..	..	..	..	..		..		..
	..	..	..	..	..				
Aug.									
2	..	..	..	..	..		..		..
9	15	..	..	..	..		..		..
16	..	..	..	..	..		..		..
23	..	..	..	..	..		..		..
30	..	..	..	..	..		..		..
	15	..	..	..	..				

BEANS—*continued.*

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.	Lowest Price.	Average Price.	Table of Bushel-weights for Highest Price.	Table of Bushel-weights for Lowest Price.
1899 Sept.	Imp. qr.	Imp. qr.	*s. d.*	*s. d.*	*s. d.*	lb. lb.	lb. lb.
6	..	..	..	..	..	..	..
13	..	..	..	..	..	..	..
20	..	..	..	..	..	..	..
27	20	..	..	..	..	..	..
	20	..	..	..	..		
Oct. 4	..	..	..	..	..	..	..
11	18	..	..	..	..	..	..
18	22	6	33 0	..	33 0	63	..
25	16	..	..	..	..	..	..
	56	6	33 0	..	33 0		
Nov. 1	..	..	..	..	..	.	..
8	..	..	..	..	.	..	..
15	..	..	..	..	..	..	..
22	45	..	..	..	..	..	..
29	45	..	..	..	..	..	..
	90	..	..	..	..		
Dec. 6	78	28	30 6	30 0	30 2	64	63
13	50	50	31 0	29 9	30 6	63	63
20	..	..	..	..	..	..	..
27	..	..	.	..	..	..	..
	128	78	30 11	29 10	30 5		
Result for year	2,022	984	30 6	29 1	30 1		

PRICES OF SHEEP SINCE 1818.

TABLE No. 1.—CHEVIOT SHEEP.

Year.	Wethers.					Ewes.					Lambs.				
	s.	d.		s.	d.	s.	d.		s.	d.	s.	d.		s	d.
1818	28	0	to	30	0	not quoted.					8	0	to	10	0
1819	25	0	"	27	0	15	0	to	17	0	10	6	"	12	0
1820	20	0	"	25	0	16	0	"	17	0	10	0	"	11	0
1821	18	0	"	20	0	14	0	"	16	0	7	6	"	8	0
1822	12	6	"	13	0	8	0	"	8	6	4	6	"	0	0
1823	13	6	"	18	0	7	0	"	10	6	5	6	"	6	0
1824	14	0	"	19	0	7	0	"	9	0	4	6	"	6	0
1825	29	0	"	32	0	15	0	"	19	0	9	0	"	10	6
1826	17	6	"	21	6	13	0	"	15	0	7	0	"	7	6
1827	15	0	"	24	0	not quoted.					7	0	"	8	0
1828	18	0	"	27	6	12	0	to	15	0	7	0	"	8	3
1829	18	0	"	24	0	12	6	"	14	0	7	0	"	8	6
1830	15	0	"	21	0	8	0	"	11	0	6	0	"	6	9
1831	18	0	"	25	0	9	0	"	13	0	7	0	"	8	0
1832	19	0	"	24	0	11	0	"	16	0	7	0	"	9	0
1833	22	0	"	31	0	13	6	"	20	0	8	0	"	11	3
1834	22	0	"	31	0	13	6	"	21	0	9	0	"	11	6
1835	22	0	"	27	6	18	0	"	20	6	8	0	"	11	0
1836	24	0	"	31	6	16	0	"	19	0	10	0	"	14	0
1837	19	0	"	28	0	14	0	"	19	0	10	0	"	13	0
1838	23	0	"	30	6	17	0	"	22	0	12	0	"	14	0
1839	23	0	"	31	0	14	0	"	19	0	0	0	"	13	0
1840	24	0	"	33	0	15	0	"	23	0	7	0	"	11	6
1841	23	0	"	30	0	14	0	"	22	0	8	0	"	12	0
1842	22	6	"	28	0	13	0	"	17	0	7	6	"	10	0
1843	19	0	"	25	0	8	0	"	12	0	5	0	"	8	0
1844	21	0	"	29	0	10	0	"	16	0	8	0	"	10	6
1845	23	0	"	33	0	13	0	"	20	0	8	0	"	13	0
1846	24	0	"	33	6	14	6	"	21	6	10	0	"	14	6
1847	24	0	"	35	0	13	0	"	24	0	11	6	"	15	0
1848	23	0	"	34	6	18	0	"	28	0	11	6	"	15	0
1849	21	0	"	30	2	12	0	"	21	0	0	0	"	14	0
1850	20	6	"	29	6	12	0	"	20	0	8	0	"	13	0
1851	21	6	"	31	0	13	0	"	21	0	8	9	"	14	0
1852	21	0	"	32	0	15	0	"	23	0	8	0	"	14	0
1853	26	6	"	38	0	17	0	"	28	6	9	0	"	17	0
1854	25	0	"	36	0	17	0	"	26	0	9	0	"	16	6
1855	23	6	"	36	0	16	0	"	25	0	10	0	"	17	0
1856	22	0	"	35	6	15	6	"	24	0	10	0	"	15	0
1857	24	0	"	36	0	14	6	"	26	0	10	6	"	14	6
1858	24	0	"	34	6	14	0	"	24	6	10	6	"	14	0
1859	25	0	"	34	6	16	0	"	25	0	10	3	"	14	9
1860	26	0	"	38	0	17	6	"	27	6	12	6	"	17	6
1861	25	0	"	38	6	16	0	"	28	0	9	0	"	16	0
1862	27	0	"	37	6	17	6	"	28	0	10	0	"	16	0
1863	25	0	"	38	6	19	0	"	28	6	10	6	"	16	0
1864	31	0	"	41	0	21	0	"	31	6	14	0	"	18	0
1865	32	6	"	44	0	22	6	"	33	6	14	6	"	20	0
1866	37	0	"	50	0	29	0	"	42	6	15	0	"	26	0
1867	26	0	"	58	0	18	0	"	25	6	12	0	"	16	0
1868	30	0	"	32	0	15	6	"	21	0	7	6	"	13	0
1869	28	0	"	38	0	15	0	"	22	6	7	6	"	14	0
1870	35	6	"	43	0	18	0	"	28	0	10	0	"	17	0
1871	36	6	"	49	0	22	0	"	33	6	14	0	"	20	0
1872	45	0	"	56	0	32	0	"	42	0	16	0	"	22	0
1873	42	0	"	51	0	25	0	"	42	0	15	6	"	22	0
1874	33	6	"	44	6	21	0	"	36	0	12	0	"	17	0
1875	33	0	"	48	6	21	0	"	34	0	13	6	"	23	6
1876	40	0	"	52	6	23	0	"	30	0	13	6	"	25	0
1877	41	0	"	51	0	25	0	"	37	0	15	0	"	24	0
1878	35	6	"	48	0	23	6	"	35	0	14	0	"	22	0
1879	34	0	"	44	0	21	0	"	34	0	14	0	"	20	0
1880	30	0	"	43	6	20	0	"	30	0	12	6	"	20	0
1881	32	0	"	45	6	29	0	"	34	0	14	0	"	20	0
1882	40	0	"	51	0	30	0	"	40	0	14	0	"	20	6
1883	44	0	"	55	6	34	6	"	46	6	15	6	"	23	0
1884	36	0	"	47	6	29	6	"	41	6	12	6	"	20	0

Year	Wethers.					Ewes.					Lambs.				
	s.	d.		s.	d.	s.	d.		s.	d.	s.	d.		s.	d.
1885	30	0	to	38	0	24	0	to	31	0	12	0	to	18	0
1886	32	0	"	40	0	21	0	"	29	0	12	6	"	19	0
1887	29	0	"	36	0	18	0	"	26	0	11	0	"	16	6
1888	30	0	"	38	0	19	0	"	27	0	12	0	"	17	6
1889	36	0	"	44	0	24	0	"	32	0	14	0	"	22	0
1890	31	0	"	40	0	22	0	"	30	0	12	6	"	20	0
1891	27	0	"	38	0	16	0	"	25	0	9	0	"	16	0
1892	22	0	"	30	6	13	0	"	22	0	5	0	"	11	0
1893	26	0	"	35	6	18	0	"	28	6	8	6	"	15	0
1894	26	0	"	37	0	20	0	"	31	0	10	6	"	18	6
1895	28	0	"	39	0	22	0	"	34	0	11	6	"	19	6
1896	24	6	"	34	0	19	0	"	30	6	9	0	"	16	6
1897	27	0	"	36	0	21	0	"	31	6	11	0	"	17	6
1898	27	0	"	37	0	22	0	"	32	6	12	0	"	18	6
1899	24	0	"	33	0	20	0	"	30	6	10	6	"	16	0

Table No. 2.—BLACKFACED SHEEP.

Year.	Wethers.					Ewes.					Lambs.				
	s.	d.		s.	d.	s.	d.		s	d.	s.	d.		s.	d.
1819	22	0	to	24	0	12	0	to	15	0	8	0	to	9	0
1820	20	0	"	23	3	15	6	"	17	0	7	0	"	8	6
1821	18	0	"	20	0	12	0	"	13	0	6	0	"	7	0
1822	11	6	"	13	6	5	6	"	6	0	4	6	"	0	0
1823	12	0	"	16	0	5	0	"	6	6	4	0	"	5	3
1824	9	6	"	13	6	6	0	"	7	0	4	0	"	5	0
1825	22	0	"	26	0	11	0	"	13	6	6	0	"	9	0
1826	15	0	"	17	0	8	0	"	9	0	4	6	"	6	0
1827	14	0	"	18	6	7	0	"	10	0	6	0	"	7	6
1828	15	0	"	20	0	8	0	"	11	0	5	0	"	7	6
1829	14	0	"	18	0	9	0	"	10	0	6	0	"	7	0
1830	9	6	"	13	0	4	0	"	6	0	4	6	"	6	0
1831	13	0	"	17	0	5	0	"	7	6	5	0	"	6	6
1832	14	0	"	18	0	7	0	"	11	6	6	0	"	7	8
1833	16	0	"	24	0	7	6	"	12	0	6	6	"	9	0
1834	16	0	"	22	0	10	0	"	13	0	6	0	"	8	6
1835	15	0	"	18	9	10	0	"	13	0	7	0	"	8	0
1836	15	0	"	21	0	9	0	"	12	0	8	6	"	11	0
1837	13	0	"	16	0	8	0	"	12	0	8	0	"	9	6
1838	15	0	"	20	6	10	0	"	13	0	not quoted				
1839	15	0	"	22	0	10	0	"	12	0	7	0	to	8	3
1840	15	0	"	22	6	11	0	"	12	0	7	0	"	9	3
1841	16	0	"	20	0	9	0	"	11	0	6	0	"	8	0
1842	14	0	"	19	0	7	6	"	8	0	5	6	"	7	0
1843	not quoted					4	9	"	6	6	not quoted.				
1844	15	0	to	21	0	6	6	"	10	0	5	0	to	8	0
1845	14	0	"	23	0	8	0	"	12	0	6	0	"	8	0
1846	13	0	"	24	0	10	0	"	13	0	8	0	"	9	0
1847	20	6	"	25	0	10	0	"	14	0	8	6	"	9	6
1848	20	0	"	24	0	11	3	"	12	0	8	6	"	10	0
1849	not quoted.					not quoted					7	0	"	7	6
1850			..					..			7	0	"	0	0
1851	17	6	to	23	0	9	0	to	12	0	6	6	"	8	0
1852	18	6	"	22	0	9	6	"	12	0	4	6	"	7	9
1853	23	0	"	27	0	14	6	"	16	6	8	0	"	11	6
1854	20	0	"	26	0	11	0	"	16	6	8	0	"	10	6
1855	23	6	"	26	6	14	0	"	16	0	10	0	"	11	0
1856	17	0	"	24	0	10	0	"	20	0	7	6	"	10	0
1857	20	0	"	29	0	10	6	"	15	0	9	3	"	11	0
1858	20	0	"	27	6	9	9	"	18	9	8	3	"	10	6
1859	20	0	"	25	0	10	0	"	14	0	8	9	"	11	0
1860	21	0	"	27	3	11	0	"	16	0	10	0	"	13	6
1861	21	0	"	29	0	12	0	"	22	0	6	3	"	14	0
1862	16	9	"	27	0	12	0	"	18	8	6	0	"	12	0

Year.	Wethers.	Ewes.	Lambs.
	s. d. s. d.	s. d. s. d.	s. d. s. d.
1863	20 0 to 30 6	13 0 to 16 0	8 0 to 11 6
1864	25 0 „ 30 0	15 0 „ 19 0	10 0 „ 13 6
1865	15 6 „ 32 6	15 0 „ 25 0	10 0 „ 17 0
1866	31 6 „ 40 0	20 0 „ 36 0	13 6 „ 22 6
1867	20 0 „ 30 6	14 0 „ 22 0	7 6 „ 13 6
1868	20 0 „ 26 0	10 6 „ 13 6	7 0 „ 13 0
1869	22 0 „ 28 0	11 0 „ 14 0	6 9 „ 9 0
1870	27 0 „ 32 6	13 0 „ 22 0	8 0 „ 14 6
1871	23 0 „ 37 0	13 0 „ 23 0	11 0 „ 16 3
1872	31 6 „ 45 0	18 0 „ 32 0	12 6 „ 18 0
1873	28 0 „ 39 0	16 6 „ 27 0	7 0 „ 16 0
1874	25 0 „ 35 0	13 0 „ 20 0	7 0 „ 14 0
1875	26 6 „ 37 6	15 0 „ 21 3	9 6 „ 17 6
1876	30 0 „ 40 0	19 0 „ 24 0	13 0 „ 20 6
1877	35 0 „ 38 9	18 0 „ 25 0	13 6 „ 23 0
1878	30 0 „ 36 0	17 0 „ 23 0	12 0 „ 22 0
1879	25 0 „ 35 9	16 0 „ 24 0	10 6 „ 20 0
1880	25 0 „ 38 0	16 6 „ 22 6	10 0 „ 17 0
1881	30 0 „ 39 0	15 0 „ 23 0	10 0 „ 15 0
1882	33 0 „ 46 0	20 0 „ 28 0	12 6 „ 18 6
1883	36 0 „ 50 6	24 6 „ 33 0	14 0 „ 21 6
1884	29 0 „ 43 6	19 6 „ 28 0	12 0 „ 19 6
1885	24 0 „ 34 0	13 0 „ 22 6	10 0 „ 15 0
1886	25 0 „ 34 0	12 0 „ 22 0	10 6 „ 16 0
1887	22 0 „ 30 0	11 0 „ 19 0	8 0 „ 13 0
1888	22 0 „ 32 0	13 0 „ 24 0	10 0 „ 15 0
1889	26 0 „ 40 0	18 0 „ 29 0	13 0 „ 22 0
1890	24 0 „ 37 0	14 0 „ 27 0	10 6 „ 19 0
1891	21 0 „ 37 0	10 0 „ 24 0	7 6 „ 15 0
1892	16 0 „ 28 6	6 0 „ 17 0	3 0 „ 10 0
1893	21 0 „ 37 0	12 0 „ 24 0	7 0 „ 14 6
1894	20 0 „ 37 6	14 6 „ 26 6	8 6 „ 16 0
1895	23 0 „ 41 0	16 0 „ 28 6	9 0 „ 17 0
1896	19 0 „ 35 4	13 0 „ 24 0	6 0 „ 13 6
1897	21 0 „ 36 6	15 0 „ 25 6	7 0 „ 14 6
1898	22 0 „ 37 0	16 0 „ 26 0	8 0 „ 15 0
1899	20 0 „ 33 6	13 0 „ 24 0	5 6 „ 13 0

TABLE No. 3.—PRICE OF WOOL, PER STONE OF 24 LB., SINCE 1818.

Year.	Laid Cheviot.	White Cheviot.	Laid Highland.	White Highland.
	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
1818	40 0 to 42 2	..	20 0 to 22 6	..
1819	21 0 „ 22 0	..	10 0 „ 10 3	..
1820	20 0 „ 22 0	..	9 0 „ 10 0	..
1821	18 0 „ 20 0	..	9 0 „ 10 0	..
1822	12 6 „ 14 6	..	5 0 „ 6 6	..
1823	9 0 „ 10 6	..	5 0 „ 5 9	..
1824	13 6 „ 15 0	..	6 0 „ 6 3	..
1825	10 6 „ 22 0	..	10 0 „ 10 6	..
1826	11 0 „ 14 0	..	5 0 „ 5 6	..
1827	11 0 „ 14 0	..	5 6 „ 6 9	..
1828	8 0 „ 11 0	..	5 6 „ 6 0	..
1829	8 6 „ 11 0	..	4 3 „ 0 0	..
1830	9 6 „ 11 0	..	4 6 „ 5 0	..
1831	17 0 „ 20 0	..	7 6 „ 8 6	..
1832	14 0 „ 16 0	..	7 0 „ 7 6	..
1833	18 0 „ 20 7	..	10 0 „ 11 0	..
1834	21 0 „ 24 6	..	5 6 „ 7 0	..
1835	19 0 „ 20 6	..	9 6 „ 10 8	..
1836	21 0 „ 25 0	..	10 0 „ 14 0	..
1837	12 0 „ 14 0	..	7 0 „ 7 8	..
1838	19 0 „ 22 6	..	6 0 „ 10 0	..
1839	18 0 „ 20 0	..	8 0 „ 12 0	..

Table No. 3.—PRICE OF WOOL—*Continued.*

Year.	Laid Cheviot	White Cheviot.	Laid Highland.	White Highland.
	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
1840	15 0 to 0 0	..	7 0 to 0 0	..
1841	15 0 " 16 9	..	6 0 " 7 5	..
1842	12 6 " 14 0	..	not quoted.	..
1843	9 0 " 11 6	..	5 0 to 6 0	..
1844	15 0 " 18 0	..	not quoted.	..
1845	14 6 " 17 6	..	7 6 to 8 6	.
1846	12 0 " 14 6	..	8 0 " 8 6	..
1847	12 6 " 14 0	..	not quoted.	..
1848	9 6 " 11 0	.	4 9 to 0 0	..
1849	12 0 " 16 6	..	6 0 " 6 3	..
1850	15 0 " 17 6	..	8 0 " 8 6	..
1851	12 0 " 16 0	..	8 0 " 9 3	..
1852	13 0 " 15 0	..	8 0 " 9 0	..
1853	19 0 " 22 0	..	11 0 " 12 6	..
1854	12 0 " 15 0	..	7 6 " 8 6	..
1855	14 6 " 19 0	..	8 6 " 9 0	..
1856	19 0 " 21 6	..	11 0 " 0 0	..
1857	19 0 " 24 0	..	13 0 " 14 3	..
1858	15 0 " 17 0	..	8 9 " 10 0	..
1859	18 6 " 24 0	..	10 9 " 11 6	..
1860	22 0 " 32 0	37 0 to 38 0	10 0 " 11 3	..
1861	19 6 " 27 0	from 30s. upwards	not quoted.	..
1862	18 6 " 26 0	30 0 to 37 0	11 6 to 16 0	..
1863	25 6 " 31 0	38 0 " 42 0	15 3 " 17 6	..
1864	31 0 " 39 0	47 0 " 54 0	17 6 " 20 0	..
1865	23 0 " 30 0	44 0 " 45 0	15 0 " 17 0	..
1866	24 0 " 30 0	30 0 " 38 0	14 0 " 16 0	..
1867	16 0 " 21 6	not quoted.	not quoted.	..
1868	19 0 " 26 0	28 0 to 32 0	8 6 to 9 0	..
1869	18 0 " 26 6	not quoted.	8 6 " 10 0	..
1870	15 0 " 23 6	25 0 to 26 0	9 6 " 0 0	..
1871	20 0 " 26 6	30 0 " 34 6	12 0 " 15 0	..
1872	26 0 " 37 6	40 0 " 48 0	18 0 " 21 0	..
1873	17 0 " 18 0	34 0 " 40 0	9 0 " 12 0	..
1874	18 6 " 26 6	30 0 " 34 0	9 6 " 13 0	..
1875	25 0 " 32 0	34 6 " 36 0	12 6 " 16 0	..
1876	20 0 " 24 0	30 0 " 34 6	9 6 " 12 0	..
1877	20 9 " 26 0	28 0 " 30 0	10 0 " 12 0	..
1878	18 9 " 25 0	27 0 " 32 0	8 6 " 11 6	..
1879	15 0 " 17 0	prices very low.	7 0 " 0 0	..
1880	20 0 " 24 0	30 0 to 32 0	10 6 " 11 6	14 0 to 15 0
1881	17 0 " 21 0	27 0 " 30 0	5 0 " 9 6	12 0 " 13 0
1882	14 0 " 18 0	27 6 " 28 0	7 6 " 9 0	13 0 " 14 0
1883	13 0 " 18 0	26 0 " 28 0	6 6 " 8 6	11 6 " 12 6
1884	13 0 " 18 0	26 0 " 28 0	6 6 " 8 6	11 6 " 12 6
1885	12 0 " 17 0	22 6 " 26 0	6 0 " 8 0	11 6 " 12 0
1886	13 0 " 18 0	23 0 " 27 6	6 6 " 8 6	11 6 " 12 0
1887	14 0 " 22 0	23 0 " 28 0	7 0 " 9 0	11 6 " 13 0
1888	13 0 " 20 0	23 0 " 28 0	7 0 " 9 0	11 0 " 12 6
1889	13 0 " 18 0	24 0 " 28 0	7 0 " 9 0	11 0 " 12 6
1890	13 0 " 18 0	24 0 " 28 0	7 0 " 9 0	11 0 " 12 6
1891	12 6 " 18 0	22 0 " 28 0	7 0 " 9 0	11 0 " 12 6
1892	12 0 " 18 0	20 0 " 28 0	7 0 " 8 6	10 6 " 12 0
1893	12 0 " 17 0	20 0 " 27 0	7 0 " 8 0	10 0 " 12 0
1894	12 0 " 16 0	20 0 " 26 0	7 0 " 8 0	10 0 " 12 0
1895	12 0 " 16 0	20 0 " 25 0	7 0 " 8 0	10 0 " 11 6
1896	11 0 " 15 0	19 0 " 24 0	7 0 " 8 0	10 0 " 11 6
1897	11 0 " 14 0	18 0 " 23 0	7 0 " 8 0	10 6 " 12 0
1898	10 0 " 13 0	16 0 " 20 0	7 0 " 8 0	10 0 " 11 6
1899	10 0 " 13 0	13 0 " 18 6	7 0 " 8 0	8 6 " 9 6

EDINBURGH SHOW, 1899.

THE Edinburgh Show of 1899 touched high-water mark in the history of the Society. It created fresh records all along the line. Taking all sections together, the entries reached a total never before attained; the extent of space occupied by implements and machinery was greater than at any former Show; while the showyard was by several acres the most extensive the Society has ever enclosed. Then, in regard to the attendance of the public and the financial returns, the results far out-distanced all former Shows. The profit amounted to over £3900.

Much of this phenomenal success was, of course, due to the visit of his Royal Highness the Prince of Wales. It was the first official visit of his Royal Highness to the Scottish National Show, and certainly no other event in the long history of the Society has aroused such enthusiasm and widespread interest amongst the people of Scotland as were evinced on this occasion. His Royal Highness became President of the Society for the year, and from the beginning to the end of his year of office he spared no effort to promote the success of the Show and the wellbeing of the Society. During his visit to the Show, the Prince of Wales was the guest of the Duke and Duchess of Buccleuch at Dalkeith Palace. His Royal Highness arrived at Dalkeith Palace on the evening of Tuesday, the first day of the Show, visited the Show on the Wednesday and Thursday, and returned to London on Thursday night. The freedom of the city of Edinburgh was conferred upon the Prince of Wales in the M'Ewen Hall at midday on the Thursday, and there, as in the showyard and on the route to and from the city, his Royal Highness was welcomed with boundless enthusiasm and cordiality.

A peculiarly interesting function in connection with the visit of the Prince of Wales took place in the large parade ring immediately on the arrival of the royal party on Wednesday. As a memento of the Presidency and visit of his Royal Highness, the Society offered a Champion Gold Medal for the best animal or pen in each section of cattle, horses, sheep, and swine. The medal bore the bust of the Prince of Wales on the one side and the arms of the Society on the other; and, by the permission of his Royal Highness, it was arranged that it would be known as the Prince of Wales Gold Medal. The function referred to was the presentation of these medals by his Royal Highness to the various winners. The presentation took place in front of the

Fig 161 —SHORTHORN BULL, "CORNER STONE" 68,406

Winner of the Prince of Wales Gold Medal for best Shorthorn, Edinburgh Show, 1899 Bred by and the property of Mr Alex M Gordon of Newton, Insch, Aberdeenshire Age three years and seven months

Fig 162 —ABERDEEN ANGUS BULL, "EQUESTRIAN" 9953

Winner of the Prince of Wales Gold Medal for best animal of the breed, Edinburgh Show, 1899 The property of Mr George Smith Grant, Auchorachan, Glenlivet Bred by Sir George Macpherson Grant Bart Age seven years and six months

Grand Stand, and was watched with the keenest interest by gay crowds of visitors who thronged the stands and enclosures. His Royal Highness shook hands warmly with each of the winners, and complimented them on their victory. At the close of the function the Prince of Wales made a detailed inspection of the champion animals, which were drawn up in line in the parade ring.

As President of the Society his Royal Highness occupied the chair at the general meeting of members on Wednesday afternoon, and conducted the business with characteristic tact and ability. The meeting was the largest and most widely representative ever seen in connection with the Shows of the Society, and a magnificent reception was accorded to his Royal Highness.

Immediately before the opening of the Show a great deal of rain fell, doing much damage to the showyard and causing great discomfort to exhibitors in getting live stock and implements into their places in the yard. Fortunately the weather cleared up on the Monday, and during the four days of the Show it was delightfully fine.

The attendance of the public was large all through the Show. It was especially large on the Thursday, when over 50,000 passed the entrance gates. The number of visitors during the four days exceeded 100,000.

The showyard was beautifully situated at the foot of Arthur Seat, on the Prestonfield estate of Sir William Dick Cunyngham, Bart. It was not a perfect site, yet it was in many respects an admirable one; and for the use of it the Society is much indebted, not only to the public-spirited proprietor, but also to the grazing tenants who gave up their rights for the season. The showyard extended to a little over 50 acres, yet its capacity was fully taxed.

The Show was well supported by the district. The Town Council of Edinburgh gave a donation of 400 guineas and a supply of water free of charge. The county of Mid-Lothian contributed, by means of a voluntary assessment, a sum of £417, and East Lothian, by the same means, a sum of £240. The County Council of West Lothian did not agree to levy a voluntary assessment, but by private subscriptions it raised £34 in aid of the local fund, which amounted in all to £1112.

The prize-list was, next to that for the Centenary Show in 1884, the most liberal in the history of the Society. From its own funds the Society gave prizes amounting in value to £2891, and by private donors the total value of the prizes was raised to £3845. The most noteworthy feature in the prize-list, apart from the Prince of Wales Champion Gold Medals already referred to, was the remarkably handsome list

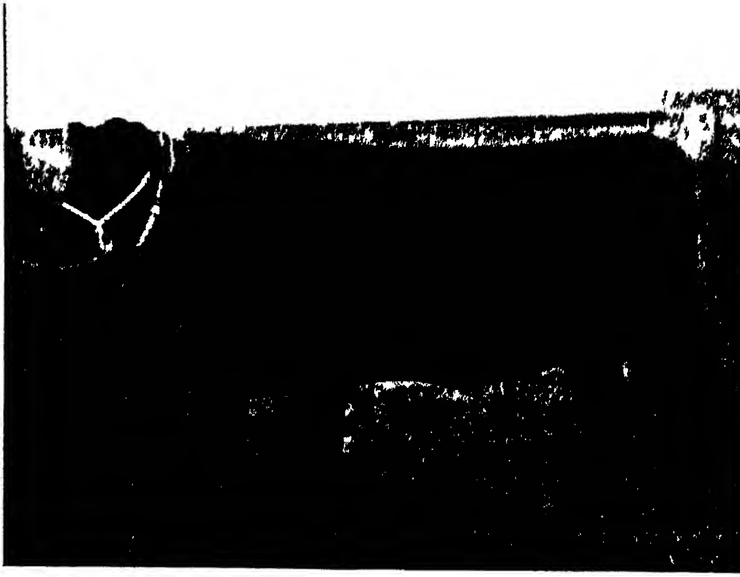


Fig 163 —Galloway Cow, "Nancy Lee 2nd of Castlemilk" 14,678

Winner of the Prince of Wales Gold Medal for best animal of the breed Edinburgh Show 1899 Bred by and the property of Sir Robert Jardine of Castlemilk, Bart Age three years and five months

Fig 164 —Ayrshire Cow, "Sweet Briar"

Winner of the Prince of Wales Gold Medal for best animal of the breed Edinburgh Show 1899 The property of Messrs R & J M Alister Mid Ascog, Rothesay Bred by Mr Hugh M Lean Ascog Rothesay Age four years

of prizes offered for hunting horses. The prizes offered in the hunter class represented no less a sum than £640, and of this sum about £440 was contributed by private donors, mainly thorough the instrumentality of Sir James H. Gibson-Craig. The prizes in some of the hunter classes were, it is believed, the most valuable ever offered in any show in the British Isles, and, as might be expected, they brought out the finest display of adult hunting horses ever seen in any showyard.

The show of live stock all through was of a very high order, and the display in the Implement department was not only unprecedentedly large, but of a superior character.

Statistics.

The following tables give the number of entries in the various sections:—

1. CATTLE.

Class.		No. of Entries.	
	SHORTHORN.		
1.	Aged bulls	22	
2.	Two-year-old bulls	22	
3.	One-year-old bulls	16	
4.	Cows of any age	12	
5.	Two-year-old heifers	15	
6.	One-year-old heifers	25	
		—	112
	ABERDEEN-ANGUS.		
7.	Aged bulls	13	
	Extra Stock	1	
8.	Two-year-old bulls	6	
9.	One-year-old bulls	8	
10.	Cows of any age	18	
11.	Two-year-old heifers	7	
12	One-year-old heifers	18	
		—	71
	GALLOWAY.		
13.	Aged bulls	4	
	Extra Stock	1	
14.	Two-year-old bulls	4	
15.	One-year-old bulls	6	
16.	Cows of any age	6	
17.	Two-year-old heifers	6	
18.	One-year-old heifers	11	
		—	38
	HIGHLAND.		
19.	Aged bulls	9	
20.	Two-year-old bulls	8	
21.	One-year-old bulls	8	
22.	Cows of any age	17	
23.	Three-year-old heifers	15	
24.	Two-year-old heifers	17	
25.	Bullocks	2	
		—	76

Fig. 165.—JERSEY COW, "FIONA BERESFORD"

Winner of the Prince of Wales Gold Medal for best animal of the breed, Edinburgh Show, 1899. The property of the Earl of Hopetoun, Hopetoun House, South Queensferry. Bred by Mr J. H. Brequet, St Peter's. Age four years and five months.

Fig. 166.—CLYDESDALE STALLION, "HIAWATHA" 10,067

Winner of the Prince of Wales Gold Medal for best Clydesdale Stallion, Edinburgh Show, 1899. The property of Mr John Pollock, Paper Mill, Langside. Bred by Mr W. Hunter, Garthland Mains, Stranraer. Age seven years.

Ayrshire.

26. Aged bulls	4	
27. Two-year-old bulls	6	
28. One-year-old bulls	5	
29. Cows in milk, calved before 1896	11	
30. Cows in milk, calved in 1896	9	
31. Cows of any age, in calf, or heifers in calf, calved in 1896	5	
32. Two-year-old heifers	6	
33. One-year-old heifers	9	
	—	55

Jersey.

34. Bulls, any age	11	
35. Cows in milk, calved before 1897	9	
36. Cows in milk, or heifers in calf, calved in 1897	6	
37. One-year-old heifers	6	
	—	32
Extra cattle		2
		386

2. HORSES.

Draught Stallions.

38. Aged stallions	10	
39. Three-year-old entire colts	16	
40. Two-year-old entire colts	22	
41. One-year-old entire colts	21	
	—	69
42. Derby of 1899—yearling colt (11).		

Draught Geldings.

43. Aged geldings	10	
44. Three-year-old geldings	9	
45. Two-year-old geldings	11	
	—	30

Draught Mares and Fillies.

46. Mares with foal at foot	7	
Extra stock	1	
47. Yeld mares, foaled before 1896	11	
48. Three-year-old yeld mares, or fillies	10	
49. Two-year-old fillies	16	
50. One-year-old fillies	25	
	—	70
51. Derby of 1899—yearling filly (10).		

Hunters.

52. Colt, gelding or filly, foaled in 1898, the produce of thoroughbred stallions	16	
53. Filly, mare, or gelding for field, foaled in 1897	18	
54. Yeld mare, filly, or gelding for field, foaled in 1896	19	
55. Mare or gelding, foaled in 1895, able to carry over 13 stone 7 lb.	13	
56. Mare or gelding, foaled in 1895, able to carry from 12 to 13 stone 7 lb.	17	
57. Mare or gelding, foaled before 1895, able to carry over 15 stone	17	
58. Mare or gelding, foaled before 1895, able to carry from 13 stone 7 lb. to 15 stone	31	
59. Mare or gelding, foaled before 1895, able to carry from 12 stone to 13 stone 7 lb.	29	
60. Hunter, brood mare, with foal at foot, or to foal this season	11	
	—	171

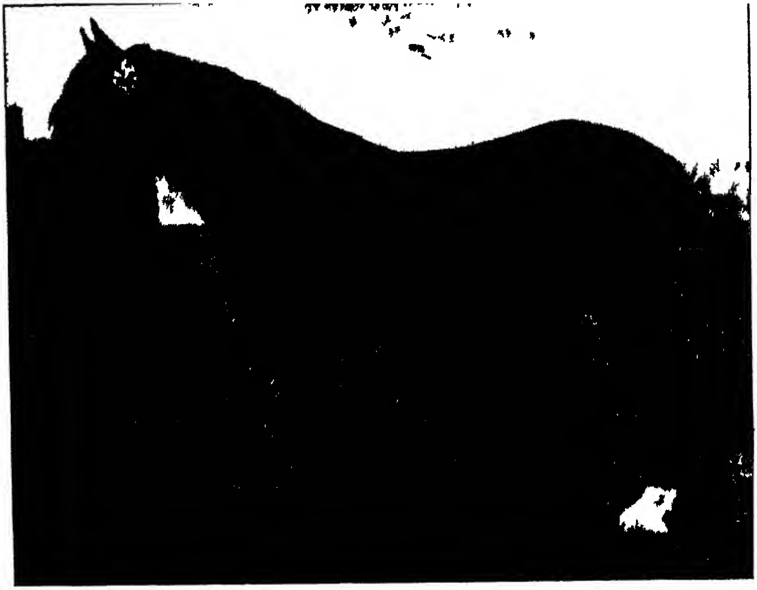


Fig 167 —Draught Gelding, "Cock of the North"

Winner of the Prince of Wales Gold Medal for best Draught Gelding Edinburgh Show 1890 The property of Mr W Clark, Netherlee, Cathcart Bred by Mr Clyne, Mossside, Drummond Age five years

Fig 168 —Clydesdale Mare, "Lady Victoria"

Winner of the Prince of Wales Gold Medal for best Clydesdale Mare or Filly Edinburgh Show, 1899 The property of Mr Herbert Webster Morton House Fence Houses Bred by Mr W Nicholson, Bombie Kirkcudbright Age three years

Hackneys.

61. Brood mares, 15 hands and upwards, with foal at foot, or to foal this season to a registered sire	7	
62. Brood mares, under 15 hands, with foal at foot, or to foal this season to a registered sire	4	
Extra stock	1	
63. Yeld mares or fillies, three years old	7	
64. Fillies, two years old	12	
65. Fillies, one year old	7	
66. Stallions, foaled in or before 1896, over 15 hands	6	
Extra stock	1	
67. Stallions, foaled in or before 1896, over 14 and not over 15 hands	5	
68. Entire colts, two years old	7	
69. Entire colts, one year old	7	
	—	64

Roadsters.

70. Roadster, mare or gelding, foaled before 1896, 15 hands and upwards	15	
71. Roadster, mare or gelding, foaled before 1896, 14.2 and under 15 hands	16	
	—	31

Ponies.

72. Stallions, 3 years old and upwards, over 12 and not exceeding 14 hands	3	
73. Yeld mares, fillies, or geldings, 3 years old and upwards, over 13 and not over 14½ hands	13	
74. Yeld mares, fillies, or geldings, 3 years old and upwards, over 12 and not over 13 hands	12	
75. Stallion, 3 years old and upwards, 12 hands and under	1	
76. Yeld mares, fillies, or geldings, 3 years old and upwards, 12 hands and under	7	
77. Shetland stallions, not exceeding 10½ hands, foaled before 1896	10	
Extra stock	3	
78. Shetland mares, not exceeding 10½ hands, with foal at foot	7	
79. Shetland yeld mares, fillies, or geldings, not exceeding 10½ hands, foaled before 1897	11	
80. Shetland colts, geldings, mares, or fillies, foaled in 1897 or 1898, not exceeding 10½ hands	9	
	—	76

Driving Competitions.

81. Yeld mares, fillies, or geldings, in harness, 15 hands and upwards (9)	2	
82. Yeld mares, fillies, or geldings, in harness, under 15 hands (36)	4	
Extra stock	1	
	—	7
		518

Jumping.

1. Horses - open	Entries not closed.
2. Ponies, 14.3 hands and under	
3. Horses—open handicap	
4. Ponies, 14.3 hands or under—handicap	
5. Horses - open handicap	
6. Ponies, 14.3 hands or under—handicap	

ZEBRA AND ZEBRA HYBRIDS.

Zebra and zebra hybrids	19

3. SHEEP.

Blackfaced.

83. Tups above two shear	7	
84. Two shear tups	15	
85. Shearling tups	44	
86. Ewes above one shear, with lambs	15	
87. Shearling ewes or gimmers	18	
	—	99

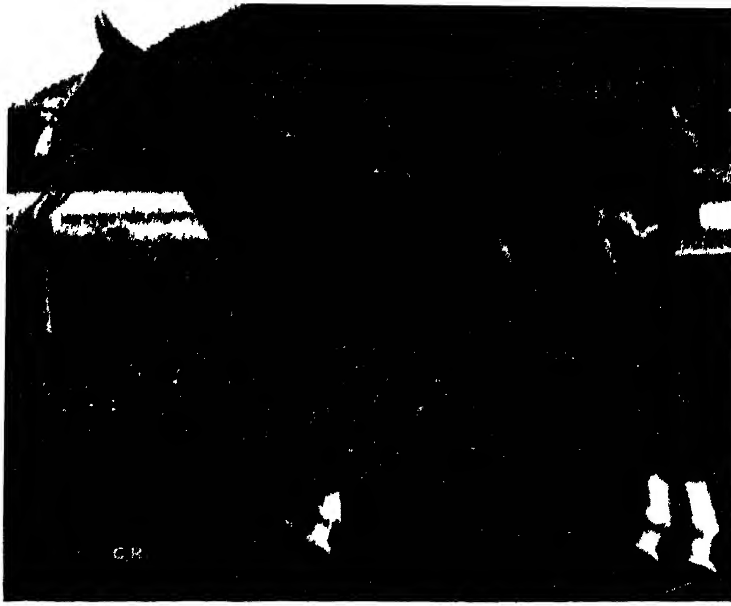


Fig 169 —HUNTER GELDING, "GENDARME"

Winner of the Prince of Wales Gold Medal for best Hunter Colt or Gelding, Edinburgh Show, [illegible] The property of Mr T D John Chaldeans Stud Farm, St Fagans, Cardiff Bred by Mr Joseph Mount Gunby, Lincolnshire Age six years

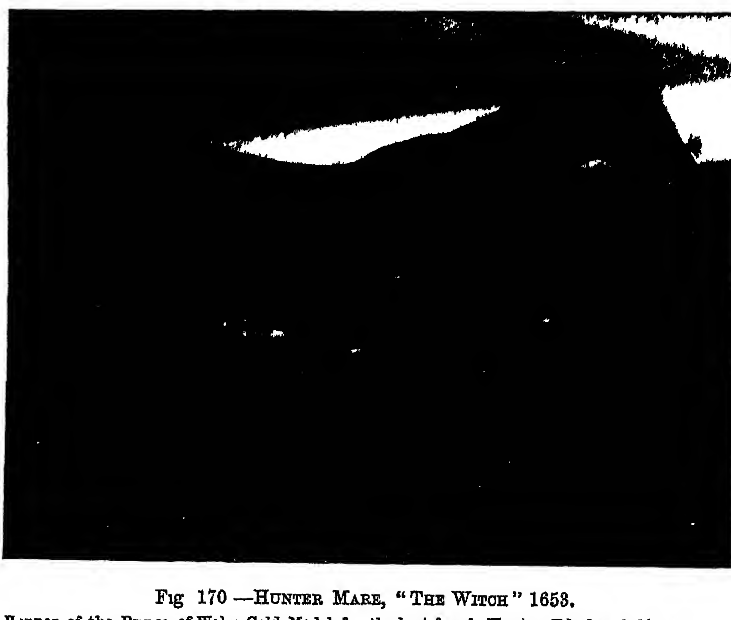


Fig 170 —HUNTER MARE, "THE WITCH" 1653.

Winner of the Prince of Wales Gold Medal for the best female Hunter, Edinburgh Show, 1899 The property of Mr T D John, Chaldeans Stud Farm, St Fagans, Cardiff Bred by Mr W R H Tyler Rodhuish, Taunton Age fourteen years

Cheviot.

88. Tups above one shear	20	
89. Shearling tups	27	
90. Ewes above one shear, with lambs	15	
91. Shearling ewes or gimmers	24	
	—	86

Border Leicester.

92. Tups above one shear	10	
93. Shearling tups	54	
94. Ewes above one shear	15	
95. Shearling ewes or gimmers	33	
	—	112

Half-bred.

96. Tups above one shear	4	
97. Shearling tups	23	
98. Ewes above one shear	12	
99. Shearling ewes or gimmers	22	
	—	61

Shropshire.

100. Tups above one shear	8	
101. Shearling tups	16	
102. Ewes above one shear	10	
103. Shearling ewes or gimmers	12	
104. Five shearling rams	2	
	—	48

Oxford Downs.

105. Shearling tups	11	
106. Shearling ewes or gimmers	7	
	—	18

Suffolk.

107. Shearling tups	4	
108. Shearling ewes or gimmers	6	
109. Three ewe lambs	4	
	—	14

Extra Sections.

110. Three blackfaced wethers, one shear	9	
111. Three Cheviot wethers, one shear	7	
112. Three shearling wethers, any cross out of blackfaced ewe	7	
113. Fat lambs, any breed or cross	16	
	—	39
		477

4. WOOL.

114. Blackface wether wool	2	
115. Blackface ewe wool	6	
116. Blackface ewe or wether hogg wool	6	
	—	14

5. SWINE.

117. Boars, large white breed	6	
118. Sows, large white breed	8	
119. Pigs not above 8 months old, large white breed	7	
120. Boars, white breed other than large	2	
121. Sow, white breed other than large	2	
122. Pigs not above 8 months old, white breed other than large	2	
123. Boars, Berkshire breed	7	
124. Sows, Berkshire breed	8	
125. Pigs not above 8 months old, Berkshire breed	4	
	—	46

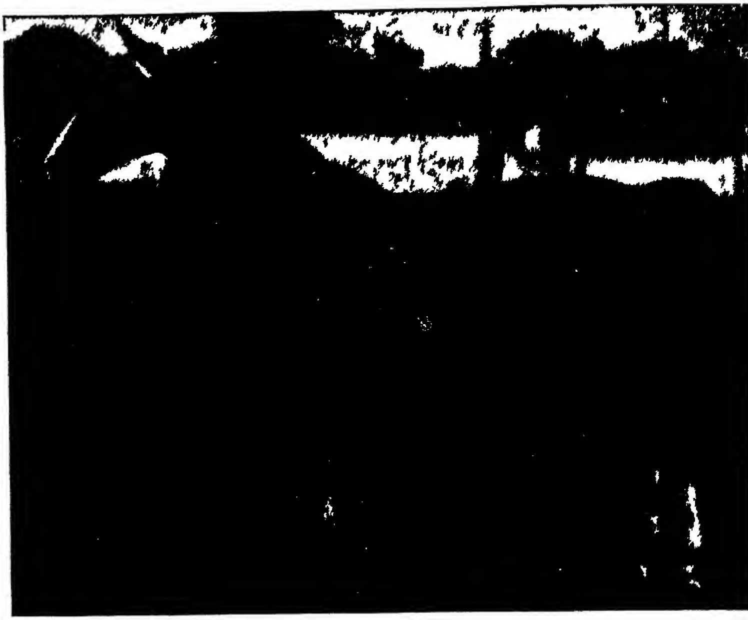


Fig 171 —Hackney Mare, "Orange Blossom" 5957

Winner of the Prince of Wales Gold Medal for best female Hackney Edinburgh Show 1899 The property of Mr Harry Livesey, Rotherfield Sussex Bred by Mr Baxter, Barton Pidsea Hull Age eight years

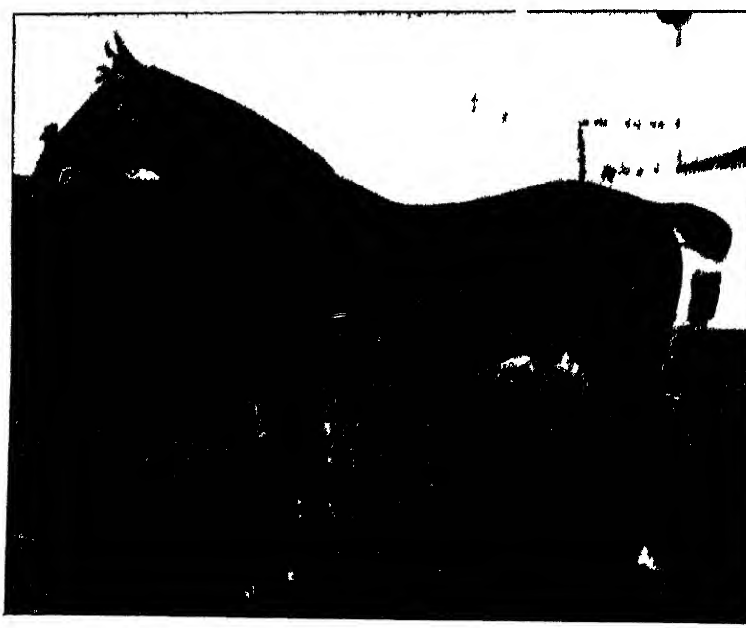


Fig 172 —Hackney Stallion, "Hedon Squire" 4306

Winner of the Prince of Wales Gold Medal for the best male Hackney Edinburgh Show 1899 The property of Sir Walter Gilbey Bart, of Elsenham Hall, Essex Bred by Mr Arthur Fewson Hedon Hall Hull Age eight years

6. POULTRY.

1–80 Poultry 551

7. DAIRY PRODUCE.

1. Cured butter 10
2. Powdered butter 13
3. Fresh butter . . . . 21 — 44

8. BUTTER-MAKING.

Class.	No. of Entries.
1. Open	36
2. Mid-Lothian pupils	23
3. Mid-Lothian pupils	12
	71

ABSTRACT.

	No. of Entries.
1. Cattle	386
2. Horses	518
3. Sheep	477
4. Wool	14
5. Swine	46
6. Poultry	551
7. Dairy produce	44
8. Butter-making competitions	71

The following table gives a comparative view of the display of cattle, horses, sheep, swine, poultry, dairy produce, and implements, of the value of the premiums offered, and of the receipts at the entrance-gates, grand stands, and for catalogues at the Shows which have been held at Edinburgh:—

Year.	Cattle.	Horses.	Sheep.	Wool.	Swine.	Poultry.	Dairy Produce.	Butter-making.	Implements.	Premiums.	Receipts.
1822	58	...	1	..	2	...	...	...	...	£78	£51
1823	44	...	8	...	12	...	...	...	..	110	75
1824	62	..	18	..	5	...	...	...	30	105	59
1825	42	...	6	...	7	..	...	...	20	110	80
1827	44	...	24	...	6	...	...	...	50	224	83
1842	295	179	175	...	53	.	38	...	200	1200	1,373
1848	351	142	325	...	58	128	165	...	310	1153	1,398
1859	332	188	288	...	80	327	54	...	980	1500	2,343
1869	310	212	340	...	42	717	...	..	1900	1600	4,078
1877	339	342	305	..	38	302	..	..	2292	2714	6,734
1884	580	453	493	...	49	253	104	...	2282	4343	6,548
1893	349	380	294	...	49	360	88	...	2268	2600	4,917
1899	386	518	477	14	46	551	44	71	2585	3844	10,285

Fig 173 —Hackney Mare, "Sonata" 10,516

Winner of the Prince of Wales Gold Medal for best animal in the Roadster or Harness classes, Edinburgh Show 1911 The property of Mr A. E Evans, Bronwylfa, Wrexham Bred by Mr Richardson Gunsted, Hull Age seven years

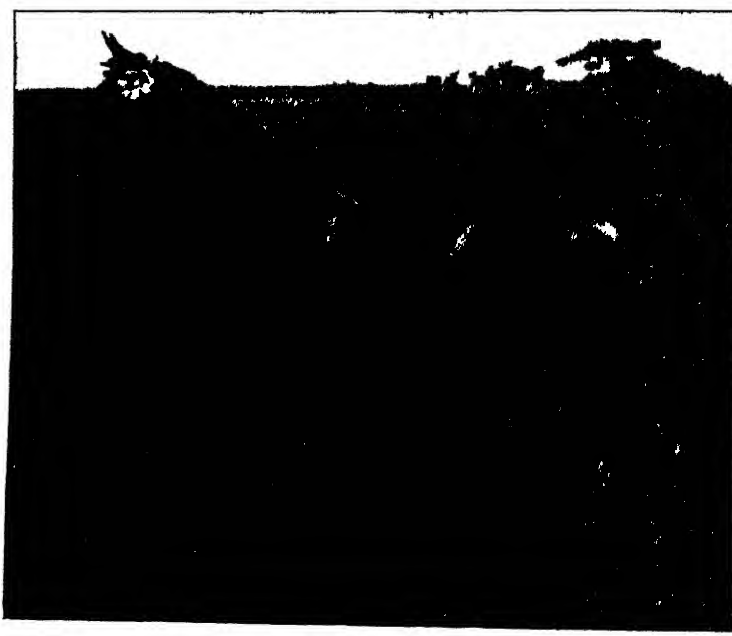


Fig 174 —Pony Mare, "Love Letter" 11,028

Winner of the Prince of Wales Gold Medal for best Pony, Edinburgh Show, 1911 The property of Mrs Fred Holmes, Staveley Grange, Shipley Bred by Mr C Hutchinson, Sancton Grange, Brough Age five years

A Comparison.

The following figures, relating to eight of the most successful Shows the Society has held, will be perused with interest:—

	Cattle.	Horses.	Sheep.	Swine.	Poultry.	Total Live Stock.	Implements.	Premiums.	Drawings at Show.	Profit.
Edinburgh, 1869	310	212	340	22	239	1123	1900	£1600	£4,078	£2067
Glasgow, 1875 .	411	405	296	48	479	1639	2220	2665	6,231	3316
Edinburgh, 1877	339	342	305	30	234	1250	2292	2714	6,734	3710
Edinburgh, 1884	580	453	493	35	253	1814	2282	4343	6,548	1855
Edinburgh, 1893	380	349	294	31	360	1414	2268	2600	4,918	2323
Aberdeen, 1894 .	314	324	184	34	365	1221	2532	2440	5,121	1678
Perth, 1896 .	292	258	204	20	374	1148	1945	2205	4,788	2511
Edinburgh, 1899	386	518	477	46	551	1978	2585	3844	10,285	3911

Cattle.

The show of cattle was not only large, but in regard to merit it was remarkably good. It has, indeed, rarely been better. All the breeds made a highly creditable appearance.

Again the Shorthorn breed had the largest number of entries, and in merit there was no falling off from the high standard of recent Shows. The Prince of Wales Gold Medal for the best animal of the breed went to Mr A. M. Gordon of Newton, for "Corner Stone" 68,406 (fig. 161), an exceptionally attractive roan of admirable character, bred at Newton, got by "Touchstone" 60,073, and out of "Butterscotch" by the famous sire "Star of Morning" 58,189. Mr Gordon had the credit of being the breeder of the champion Shorthorn at the Kelso Show of 1898, and his still greater victory on this occasion was exceedingly popular. The Shorthorn bull classes were all strongly filled, the leading winners being animals of high merit. Sir John Gilmour's very useful bull, "Brave Archer" 70,018, made a very close second in the old bull class. Mr Harrison's handsome bull "Comely Beauty" 72,267, which headed the class of two-year-old bulls, was greatly admired; and so also was "Matchless" 73,031, the second-prize bull shown from her Majesty's fine herd at Windsor. The Queen had a capital winner in a specially strong class of yearling bulls in "Royal Duke," a very handsome roan, bred at Windsor, and got by "Prince Victor" 73,320. The cow and heifer classes of Shorthorns were stronger than usual both as to numbers and merit.

The Aberdeen-Angus breed as usual formed one of the best features of the Show. The classes were well filled as to numbers, and a very fine appearance the animals made in the

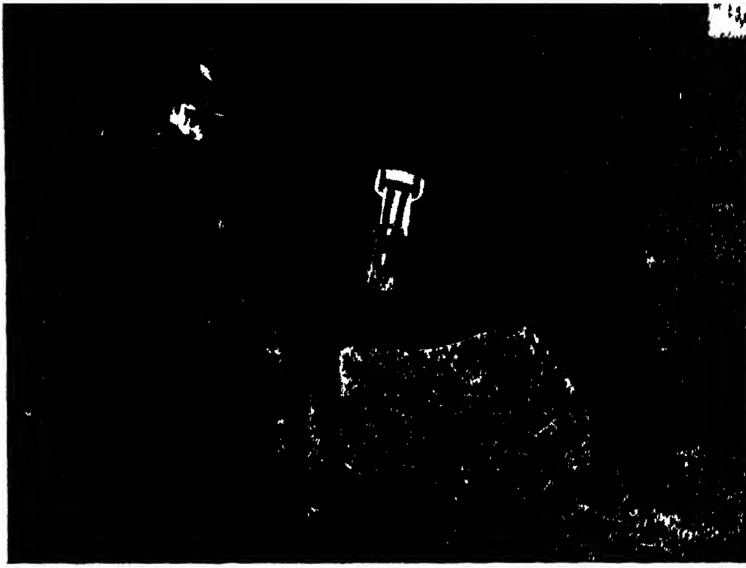


Fig 175 —SHETLAND PONY STALLION, "GONDOLIER"

Winner of the Prince of Wales Gold Medal for best Shetland Pony, Edinburgh Show, 1899 Bred by and the property of the Marquis of Londonderry, Maryfield, Bressay, Shetland Age six years

Fig 176 —BLACKFACED TUP

Winner of the Prince of Wales Gold Medal for best animal of the breed, Edinburgh Show, 1899 Bred by and the property of Mr C Howatson of Glenbuck, Lanark Age five shear.

ring. The Prince of Wales Gold Medal for the best animal of the breed in the Show went to Colonel Smith Grant, Auchorachan, for his grand seven-year-old Ballindalloch-bred bull "Equestrian" 9953 (fig. 162). This very handsome bull, having won the first prize in the adult bull class at the Dumfries Show in 1895, could only be entered here as "Extra Stock," and was therefore not eligible to compete for the Gold Medal of the Polled Cattle Society, which was limited to the ordinary breeding classes. "Equestrian," it will be remembered, won the President's Champion Medal at the Perth Show in 1896, and again he was a clear winner in a remarkably strong muster of the breed. Good, however, as "Equestrian" is, he was closely followed by Sir George Macpherson Grant's well-formed bull "Prince Ito" 12,869, which headed the old bull class and won the Gold Medal of the Polled Cattle Society for the best animal of the breed in the ordinary breeding classes. The younger classes of Aberdeen-Angus bulls were fairly large in numbers and of high average merit. The cow class was exceptionally strong both as to numbers and merit; two-year-old heifers made a good class, and yearling heifers a class of exceptional merit.

Galloway cattle were not strongly represented in numbers, but there was no falling off in merit. Sir Robert Jardine won the Prince of Wales Gold Medal with "Nancy Lee 2nd of Castlemilk" 14,678 (fig. 163), a well-shaped cow bred by himself, and got by "Black Douglas of Castlemilk" 5002. The Galloway bull classes were small, but the winners were animals of high character. The Heifer classes were very attractive, especially the class of yearling heifers, which contained a number of remarkably handsome animals.

Not for many years have a better representation of the shaggy Highland breed been seen in the Scottish National Showyard than on this occasion. The entry was a large one, and the grand appearance made by the breed was one of the most attractive features of the cattle parades. The Prince of Wales Gold Medal for the best animal of the breed went to the Duke of Atholl for his stylish bull "Calum Riabhach II. of Atholl" 1325 (fig. 38, p. 181). This very handsome bull was bred by his Grace, and got by "Valentine V." 1062. The classes of Highland females were uniformly strong, the chief winners being true representatives of the breed.

Ayrshire cattle turned out fairly well in numbers, and as usual the average standard of merit was very high. In this class the Prince of Wales Gold Medal went to Messrs R. & J. M'Alister, Mid Ascog, Rothesay, for "Sweet Briar" (fig. 164), a well-formed, useful-looking four-year-old cow, bred by Mr Hugh M'Lean, Ascog, and got by "Royal Blood."

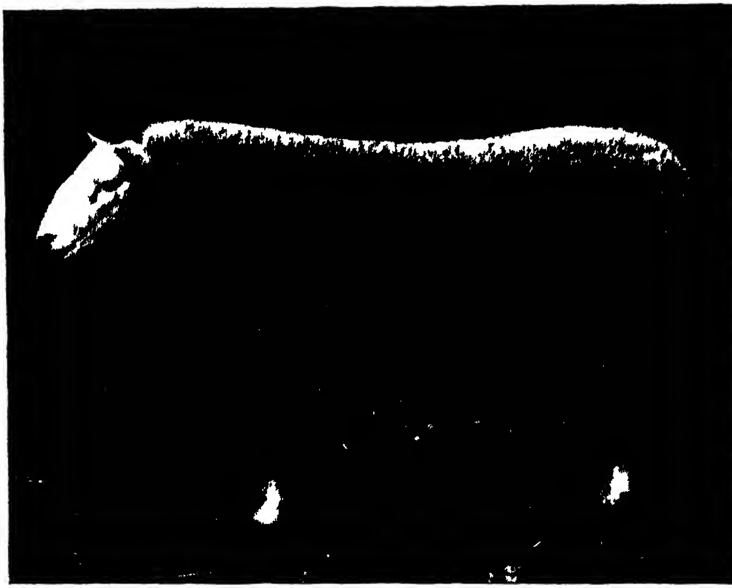


Fig. 177.—Cheviot Tup

Winner of the Prince of Wales Gold Medal for best animal of the breed, Edinburgh Show, 1899
Bred by and the property of Mr John Elliot, Hindhope, Jedburgh

Fig. 178.—Border Leicester Ewe.

Winner of the Prince of Wales Gold Medal for the best animal of the breed, Edinburgh Show, 1899 Bred by and the property of Mr David Hume, Barrelwell, Brechin.

Classes were introduced on this occasion for Jersey cattle, and they were all fairly well filled. In regard to merit the breed was creditably represented. The Prince of Wales Gold Medal for the best Jersey animal in the Show went to the Earl of Hopetoun for "Fiona Beresford" (fig. 165), a very stylish four-year-old cow, bred by Mr J. H. Brequet, St Peter's, Jersey.

Horses.

Clydesdale horses as usual made a very fine display, alike as to numbers and quality. The stallion classes were fairly well filled as to numbers, and the standard of merit was high enough to satisfy even the keenest of critics. The colt classes were both large, and they contained many animals of high promise. The Prince of Wales Gold Medal for the best draught colt or stallion was won by Mr John Pollock, Paper Mill, Langside, for his well-known Clydesdale stallion "Hiawatha" 10,067 (fig. 166).

In the class of yearling draught colts H.R.H. the Prince of Wales exhibited his handsome Shire colt "Benedick," which headed his class at the Royal English Show at Maidstone. As indicating the wide divergence between Scotch and English ideas regarding the types of draught horses, it is interesting to note that this characteristic Shire colt was not included amongst the animals ticketed by the judges.

Draught geldings made a creditable show, the Prince of Wales Gold Medal going to Mr W. Clark, Netherlea, Cathcart, for his handsome brown gelding "Cock of the North" (fig. 167).

Draught females filled their classes well, and included amongst their number a great many animals of high merit. Here the winner of the Prince of Wales Gold Medal was found in Mr Herbert Webster's grand three-year-old filly "Lady Victoria" (fig. 168), bred by Mr W. Nicholson, Bombie, Kirkcudbright, got by "Baron's Pride" 9122, and out of the "Macgregor" mare "Kate of Bombie" 13,220. The Cawdor Cup also went to "Lady Victoria."

As already indicated, the display of hunting horses was a noteworthy feature of the Show. It was, in the opinion of competent authorities, one of the finest musters of hunters ever seen in any British showyard. There were, it will be seen, no fewer than 171 entries in the various hunter classes, while in the classes for "made" hunters alone there were over a hundred horses, including many of the best hunters in the United Kingdom. The keenest interest was manifested in all the parades of the hunting horses, and not for many a long day will lovers of hunting horses forget the displays they witnessed in the showyard at Prestonfield. The Prince of Wales Gold

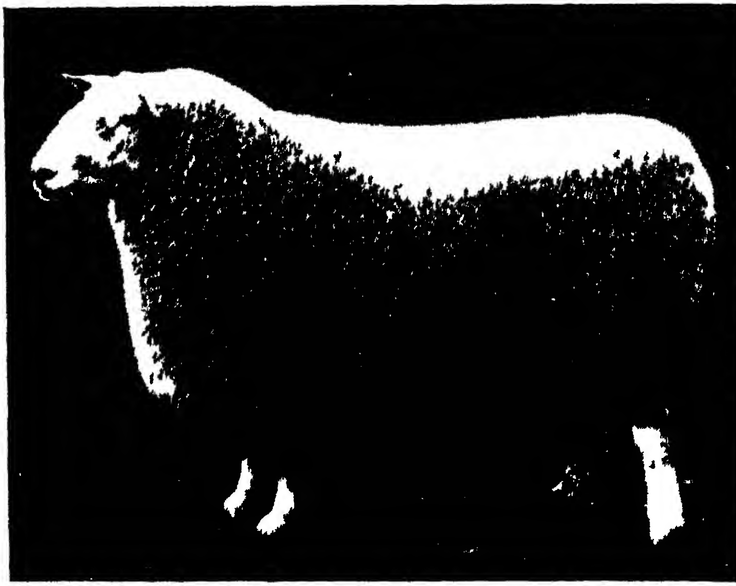


Fig 179 —HALF BRED TUP

Winner of the Prince of Wales Gold Medal for best animal of the breed Edinburgh Show, 1899
The property of Mr J A W Mein, Hunthill, Jedburgh Bred by Mr Smart The Bow

Fig 180 —SHROPSHIRE TUPS

Winners of the Prince of Wales Gold Medal for best pen of the breed Edinburgh Show, 1899
The property of Mr Alfred Tanner, Shrawardine, Shrewsbury

Medal for the best Hunter, colt or gelding, went to Mr T. D. John, Chaldeans Stud Farm, St Fagans, Cardiff, for his grand gelding "Gendarme" (fig. 169), a stylish six-year-old chestnut, bred by Mr Joseph Mount, Gunby, Lincolnshire, and got by "Blueblood." The Prince of Wales Gold Medal for the best female Hunter also went to Mr T. D. John, the winner in this case being "The Witch" 1653 (fig. 170), a very attractive fourteen-year-old bay mare, bred by Mr W. R. H. Tyler, Rodhuish, Taunton, and got by "The Ghost."

Hackney horses also made a creditable display, both in the male and female classes. In the latter the Prince of Wales Medal went to Mr H. Livesey, Rotherfield, Sussex, for his handsome eight-year-old chestnut mare "Orange Blossom" 5957 (fig. 171), bred by Mr Baxter, Barton, Pidsea, Hull. In the former the Prince of Wales Gold Medal went to Sir Walter Gilbey for his valuable stallion "Hedon Squire" 4306 (fig. 172).

The two classes of Roadsters were well filled, chiefly with hackneys of a high character. The Prince of Wales Gold Medal for the best animal in the Roadster or Harness classes was awarded to Mr A. E. Evans, Bronwylfa, Wrexham, for his stylish hackney mare "Sonata" 10,516 (fig. 173), bred by Mr Richardson, Gunstead, Hull, and got by "Saxon" 2674.

The classes of Ponies were not large, but they made a capital appearance in regard to merit. The Prince of Wales Gold Medal for the best pony went to Mrs Fred. Holmes, Staveley Grange, Shipley, for her beautiful five-year-old bay mare "Love Letter" 11,028 (fig. 174), bred by Mr C. Hutchinson, Saucton Grange, Brough, and got by "His Majesty" 2513. Shetland ponies as usual formed an especially attractive feature in the Show. Here the Prince of Wales Gold Medal was won by the Marquis of Londonderry with "Gondolier" (fig. 175), a typical representative of this useful race of ponies, bred by his lordship, got by "Thor" 83, and out of "Georgina" 187.

The display in the Driving classes was highly creditable; and in the Jumping contests there were large entries and excellent performances.

Sheep, &c.

The show of Sheep was not only large, but also of the highest merit, this remark applying equally to all the leading breeds represented. The pens which won the Prince of Wales Gold Medal on the various sections are portrayed in figs 176 to 182.

There was a small but high-class show of Swine, a few excellent pigs appearing in each of the classes. Here the Prince of Wales Gold Medal went to Mr J. Jefferson, Peel Hall, Chester, for "Peel Daisy" 6695, a very handsome sow of the Berkshire breed. Unfortunately this fine sow died in the showyard, and

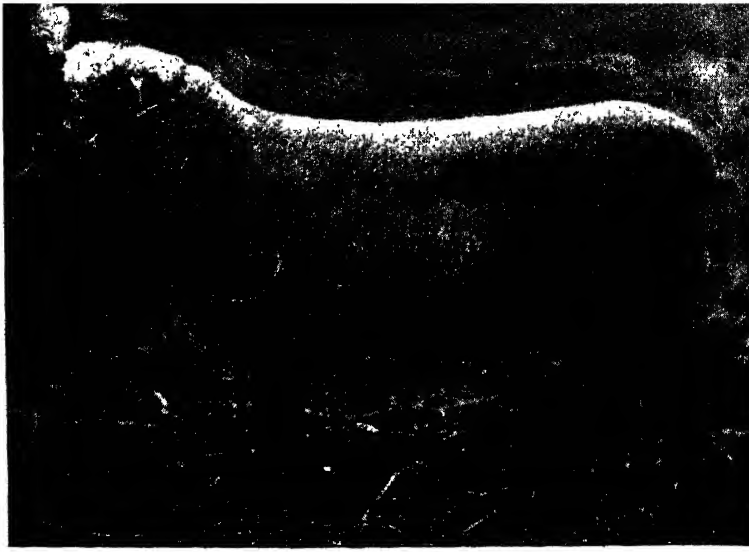


Fig. 181.—Oxford Down Tup.

Winner of the Prince of Wales Gold Medal for best animal of the breed, Edinburgh Show, 1899.
Bred by and the property of Messrs J. & S. Treadwell, Winchendon, Aylesbury.

Fig. 182.—Suffolk Tup.

Winner of the Prince of Wales Gold Medal for best animal of the breed, Edinburgh Show, 1899.
Bred by and the property of the Earl of Ellesmere, Stetchworth Park, Newmarket.

we are therefore unable to include her portrait amongst the portraits of the other winners of the Prince of Wales Gold Medal.

The prizes offered for Wool brought out a small but interesting collection of fleeces.

Zebra Hybrids.

For a number of years Professor Cossar Ewart of the Edinburgh University has been carrying out at the Bungalow, Penicuik, an exceedingly interesting series of experiments, designed with the object of elucidating various important points connected with stock-breeding. One of the chief questions which have engaged Professor Ewart's attention in these experiments is that known as the "telegony" or "infection" theory—the theory that the influence of a sire once mated with a female may show itself in the later produce of that female by other sires. The sire which has for the most part been used in the "telegony" experiments is "Matopo," a pure Burchell zebra (Chapman variety) imported from South Africa, and now about ten years of age. "Matopo" has been mated at Penicuik with a number of mares of various breeds, ranging from 11 to 15 hands high, and these unions have given Professor Ewart an exceedingly interesting lot of zebra hybrids.

By desire of the Society, Professor Ewart sent for exhibition at the Edinburgh Show a collection of nineteen animals, including the zebra stallion "Matopo," several of the mares with which he has been mated, and a number of the crosses thus produced. The animals were exhibited in a stable by themselves, and during the Show they were inspected with the deepest interest by large crowds of people. His Royal Highness the Prince of Wales made a minute inspection of them on the third day of the Show, and was so impressed with the importance of the display that he expressed a desire to have the animals exhibited at the show of the Royal Agricultural Society of England, to be held at York next June, under the presidency of his Royal Highness.

So far as they have gone, Professor Ewart's experiments tend to weaken rather than to strengthen the "telegony" theory. This will be gathered from the following notes which Professor Ewart has been good enough to supply.

Summary of Results of Professor Ewart's Telegony Experiments with the Equidæ.

MULATTO (12 2 hands, black West Highland pony).

First foal, a hybrid (Romulus) by a Burchell zebra (Matopo). Romulus, born 12th August 1896, is richly striped, and about the size of his dam.[1]

[1] For a full account of Romulus and the other hybrids see 'The Penycuik Experiments.' A. & C. Black, London, 1899.

Second foal, by a grey Arab horse (Benazrek), born July 1897. This foal (a colt) showed numerous faint markings for some weeks after birth, but before it died, when about five months old, it was of a dark-grey colour and quite devoid of markings or any other suggestions of a zebra.

Third foal, born May 1899, by a dark-brown pony (Loch Corrie) of the same strain as Mulatto. This foal, though darker in colour, was about as distinctly striped at birth over the quarters as the foal by the grey Arab. Now (February 1900) the foal is as dark, and apparently as free from any taint of a zebra, as her dam.[1]

NORA (11·1 hands, black Shetland pony).

First foal, a bay colt by Wallace, a black Shetland stallion. At birth there were about twenty stripes, of which three persisted across the shoulders. Nora at the birth of her first foal in 1895 was under three years of age.

Second foal, by Benazrek, born prematurely in 1896.

Third foal, a hybrid (Norette) by Matopo, born 1897. This hybrid, though as dark as Romulus, is the most zebra-like of all Matopo's offspring, alike in make and in disposition.

Fourth foal, a bay filly by a Welsh bay pony having a dorsal band and indications of shoulder stripes. This foal, born 1898, is in make very like her sire, but even at birth there were no indications of stripes.

Fifth foal, a filly hybrid (Eyra) by Matopo, darker than Norette and somewhat more like a pony.

BIDDY (14 hands, bay Irish roadster).

First foal, a hybrid (Remus) by Matopo, richly striped, the body colour somewhat lighter than in his dam; born 1897.

Second foal, a bay filly by a thoroughbred chestnut horse (Tupgill). This filly, born 1898, never had any stripes or any suggestions of a zebra or a zebra hybrid.

Third foal, a bay filly by a chestnut hackney horse (Gold). This foal, born 1899, which moves like a hackney, has never in any way resembled a zebra.

TUNDRA (12 hands, skewbald Iceland pony).

First foal, a yellow dun, sire unknown.

Second foal, a hybrid (Hecla) by Matopo, born 1897, of a dark colour, indistinctly striped, and in make like a pony.

Third foal, a skewbald filly with the light bay patches of about the same size and in the same positions as in her dam. A yellow forelock and a yellow bunch of hair in the tail like her dam, and like her dam a pacer. Sire a bay Shetland pony.

Fourth foal, a hybrid (Sir John) by Matopo. This hybrid in its colouration realises one's conception of the primeval horse. The body colour is of a yellowish-fawn tint, the stripes reddish-brown, and arranged more like the stripes of the Somali zebra than those of its sire. It looks more a pony than a zebra, and reminds one of the richly striped yellow dun ponies occasionally exported from Thibet.

[1] Two West Highland ponies, one black, one brown, of the same strain as Mulatto, and, like Mulatto, the property of Lord Arthur Cecil, had each a foal to Loch Corrie last summer at Knowle, Kent. These foals had as many markings as Mulatto's, though neither of the dams had ever seen a zebra. Hence the subtle temporary markings on Mulatto's second and third foals were probably inherited from some of their dun-coloured Highland ancestors.

RONA (14·1 hands, bay Irish thoroughbred mare).

First foal (born 1898, before Rona was three years old), a leather dun-coloured hybrid by Matopo, with indistinct stripes.

Second foal (born 1899), a bay foal by a hackney pony (Mars Royal). This foal never in any way resembled a zebra or a zebra hybrid.

VALDA (14·1 hands, Irish chestnut polo pony, aged).

First foals, twin hybrids by Matopo—a colt and filly. The filly died soon after birth. The colt has the dam's colour, and though richly striped, is more a horse than a zebra.

Second foal, a chestnut colt, by a chestnut thoroughbred horse (Lockstitch). This colt is richer in colour than his dam, but differs in no point from ordinary thoroughbred foals.

LADY DOUGLAS (15 hands, bay cart-mare).

First foal, a bay hybrid (Brenda) by Matopo (born 1897), with the stripes less distinct than in Remus.

Second foal, a nearly black hybrid (Black Agnes), very unlike and already as large as her full sister Brenda. At birth the usual hybrid stripes over the quarters were crossed obliquely by less distinct stripes, probably inherited from the dam's ancestors.

Lady Douglas missed having a foal in 1889. She is now in foal to Mars Royal.

LAURA (14 hands, bay, half-Arab mare).

First foal, a bay filly by an American trotting horse, born 1896.

Second foal, by Matopo, born prematurely.

Third foal, a chestnut colt by Lockstitch, born 1898.

Fourth foal, a bay filly by Lockstitch. Neither of these foals in any way suggest a zebra.

HALFTAIL (13 hands, flea-bitten, New Forest pony).

This pony had a mule in 1895 by a Forest donkey. In 1896 she was served by Matopo, but missed having a foal. In 1897, and again in 1898, she had a foal to the grey Arab Benazrek; in 1899 she died four days before her foal (by Mars Royal) was due. The two Benazrek foals (now in Kent) are extremely like Arabs, but each, like the sire, has a bald face. The unborn foal was perfect in every way; there was no large white patch on the face, nor anything suggesting the previous donkey sire. The elder of the two half-Arab foals (a filly) had a number of faint stripes for some time after birth, and one of the hind chestnuts is wanting—the corresponding chestnut is present in her half-sister, the mule. All the stripes vanished with the foal's coat. It has generally been supposed Arabs are rarely dun-coloured or striped. I have now an Arab filly of a reddish-grey colour (a kind of dun), with a dorsal stripe, a cloudy patch over the withers, and quite a number of stripes on the fore and hind legs far more pronounced than in many zebras. This Arab filly, bred and presented to me by Mr Wilfrid Scawen Blunt, of Crabbet Park, Sussex, though of the highest caste, is endowed with many zebra-like markings; her immediate ancestors never even saw a zebra.

None of my "subsequent" foals—*i.e.*, none of the foals of mares that had previously brought forth hybrids—as it happens, now show any zebra markings or give any hints whatever that their dams had been "infected" by their former zebra mate. Moreover, mares that gazed at the zebra before, during, and after service, that were mentally saturated with zebra, never produced striped foals. It is not a little remarkable that the most striped horse now in my possession is an Arab, and the most striped ponies

now in existence are found in isolated mountainous areas where zebras have probably never existed.

POLLY (13·2, dark-grey pony).

First foal, a dark-grey filly by a horse with a pronounced bald face and white hind shanks. In this filly there was a long, conspicuous, irregular white patch on the face, and the hind fetlocks were white.

Second foal, a light bay with black points, by a chestnut with a star. The second foal in no way resembled the previous sire.

TRIAL OF OIL-ENGINES.

As a simple and convenient source of motive power the oil- or petroleum-engine has now become a very important and necessary feature in connection with various classes of farm-work.

During the last few years the construction and mode of working of oil-engines have been greatly simplified, and at the present day the majority of these very useful motors require no more skilled attendance than is required in the case of any ordinary farm steam-engine. Of course, in order to obtain the most satisfactory results, it is equally important in the two cases that the attendant should be thoroughly conversant with the chief details in connection with the principle of action of the engine under his charge. All owners of engines—steam, gas, or oil—should assure themselves on this point, otherwise the results may be far from satisfactory. It is perhaps hardly necessary to add that strict attention should be paid to the cleanly maintenance of the engines.

There is no doubt that after taking into account the cost and carriage of fuel, superintendence, &c., the oil-engine is a cheaper source of power than the steam-engine for ordinary work on a farm; an oil-engine can be started at a moment's notice, and the fuel is only consumed while the power is actually being given off.

In order to afford the members of the Highland and Agricultural Society an opportunity of becoming better acquainted with the working and construction of some of the various types of oil-engines now before the public, the Directors decided to conduct a special trial of these motors in connection with the Edinburgh Show.

The Society reserved the right to test the power and working of each engine as considered desirable, also to make notes and observations of the same for incorporation in an official report of the trials.

The Society provided space in the Showyard, free of charge, to exhibitors submitting engines for trial.

No awards were made, and the trials were arranged so as to test the engines under their ordinary working conditions.

No stipulation was made as to the size of engine to be entered for trial, as it was felt that the exhibitors would, under the circumstances, naturally supply an engine to suit the requirements of probable customers. Had it been a competitive trial, with awards, it would then have been essential to limit the size or power of the engines entered.

As each engine is designed to burn a certain class of oil, it was decided to place no restriction on the oil used during the trials, provided the flash-point was above the present legal standard. Each exhibitor, however, was required to furnish a statement as to the description of the oil used and the price of same delivered in Edinburgh. Samples for testing purposes were taken during the trials.

Exhibitors were required to state whether their engines could work satisfactorily with any other kind of oil than that used in the trials, and the Committee had the power, should it have been found necessary, to request an exhibitor to run his engine with an oil provided by the Society.

Eventually only two descriptions of oil were used by the exhibitors—viz., "Royal Daylight" and "Russolene," costing 6½d. per gallon delivered in Edinburgh. It would appear, however, that most of the engines could work satisfactorily with any ordinary petroleum, within certain limits as to specific gravity and flash-point. In fact, it was made clear that there is no difficulty in obtaining suitable oil from the usual trade sources.

Ten engines, exhibited by seven firms, were submitted for trial; the general dimensions and particulars of these engines are given on p. 390.

The Working of an Oil-Engine.

When ordinary petroleum (specific gravity about ·8) is used for motive-power purposes in an oil-engine, it is first necessary to convert it into a vapour—not a gas. This is usually effected by allowing the oil—in sufficient quantity to constitute a working charge—together with more or less air, to enter a highly-heated chamber. All the engines submitted for trial were fitted with these vaporising chambers of various descriptions, into which the oil was either fed by gravity or pumped from a tank in the base of the engine. The oil-vapour thus formed is drawn into the engine cylinder during the suction stroke, and should there not be sufficient air already mixed with it to produce complete

General Dimensions and Particulars of Oil-Engines entered for Trial.

Exhibitor, and Description of Engine	Crossley Bros., Openshaw, Manchester.	Campbell Gas-Engine Co., Halifax. "Campbell."	Campbell Gas-Engine Co., Halifax. "Campbell."	R. Stephenson & Co., Newcastle-on-Tyne. "Rocket."	Blackstone & Co., Stamford. "Blackstone."	Blackstone & Co., Stamford. "Blackstone."	Blackstone & Co., Stamford. "Blackstone."	Tangyes, Ltd., Birmingham.	Pollock, Whyte, & Waddel, Johnstone, N.B. "Globe."	R. Cundall & Sons, Shipley. "Cundall Patent."
Declared brake horse-power	16	20	13	5	5	8	14	17½	10	8
Diameter of cylinder, inches	10	12½	9½	7	6	7	9½	11	10	8¾
Stroke, inches	18	21	18	12	12	14	18	16	18	15
Revolutions per minute, declared	180	190	210	240	240	220	200	200	220	220
Weight in cwts.	63½	100	65	17½	25	32½	70	72½	50	36
Diameter of fly-wheel	5 ft. 6 in.	5 ft. 6 in.	5 ft.	4 ft. 6 in.	3 ft. 6 in.	4 ft. 6 in.	5 ft. 6 in.	5 ft.	5 ft.	4 ft. 6 in.
Floor space occupied	10 ft. 6 in. × 5 ft. 9 in.	11 ft. 6 in. × 7 ft. 3 in.	9 ft. 6 in. × 6 ft.	7 ft. 3 in. × 4 ft.	6 ft. 5 in. × 4 ft.	8 ft. × 4 ft. 3 in.	10 ft. × 5 ft. 8 in.	10 ft. 6 in. × 5 ft. 6 in.	..	8 ft. × 3 ft. 6 in.
Price complete	£185	£280	£178	£60	£91, 15s.	£117	£166, 15s.	£168	£130	£105
Description of oil stated to be suitable	Any kind of petroleum oil of about ·8 sp. gr. and upwards.	Russolene, Broxburn, Young's, American "Water White," or Royal Daylight.	Russolene, Broxburn, Young's, American "Water White," or Royal Daylight.	American, Russian, or Scotch oil weighing from 7¾ lb. to 8¾ lb. per gallon.	Russolene, or Royal Daylight.	Russolene, or Royal Daylight.	Russolene, or Royal Daylight	Russolene, Royal Daylight, or Scotch "Oakbank."	Royal Daylight, Broxburn, Young's, or other Scotch oils.	Royal Daylight, or any other petroleum of approximate density.

combustion, a further supply of air is admitted during this stroke. This mixture of oil-vapour and air is next compressed on the return stroke, and at the end thereof is ignited by a portion coming in contact with the inside surface of a heated tube; an explosion takes place, and the working stroke is made. During the return or exhaust stroke, the products of combustion are expelled from the cylinder.

When an oil-engine is working at its full load, there is thus one explosion for every four strokes, or two revolutions. All the engines exhibited worked on this principle, which is known as the "Otto" cycle.

Should the engine be working at less than full load, a charge of oil, and therefore an explosion, is occasionally omitted, as the number of charges of oil admitted to the vaporiser is determined by the work being done by the engine.

General Description of the Engines.

Messrs Crossley Brothers, Ltd., Openshaw, Manchester.—In connection with the 16 brake horse-power engine exhibited by this firm, fig. 183 represents a vertical section through the end of the cylinder with the vaporiser removed, a vertical section of which is shown in fig. 184.

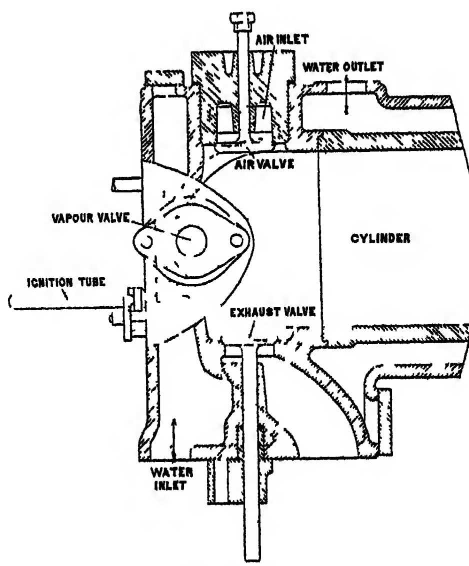


Fig. 183.—*Vertical section through end of cylinder of the "Crossley" Oil-Engine (vaporiser removed).*

The oil is drawn from a tank (fixed in the engine foundation) by two pumps, one for supplying the vaporiser lamp through an oil regulator for the purpose of regulating the pressure at which the lamp is to work; while the other pump delivers oil to an oil-measurer fixed to the side of the vaporiser casing. The oil-measurer determines the exact charge of oil required for each working stroke of the engine, any overflow being returned to the oil-tank. The charge of oil enters the vaporiser through an

oil inlet shown in fig 184, and then takes a somewhat zigzag course through the vapour passages. The oil is thus exposed to a large heating surface, and is eventually completely vaporised; to further assist vaporisation a certain quantity of air—afterwards heated—is admitted through the air inlet shown near the base of the chimney. The vaporised oil is drawn into the cylinder on the opening of the vapour valve, which is operated by a cam and lever off the side shaft, the time of opening being determined by a centrifugal governor. The vaporiser can easily be removed at any time for cleaning or renewal. The ignition tube is fixed at one end in a cone seating by means of a screw-clamp fitting.

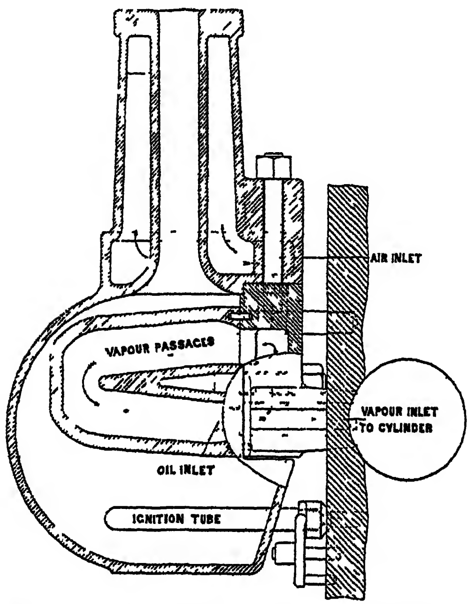


Fig. 184 —*Vertical section, on enlarged scale, through vaporiser in the "Crossley" Oil-Engine.*

The main air supply is drawn through a silencer placed in the engine foundation, the air valve, which is on the top of the cylinder, being worked and controlled direct from the side shaft by means of an eccentric and rod.

This engine was a good example of the excellent workmanship and design which is characteristic of Messrs Crossley Brothers.

The Campbell Gas-Engine Co., Ltd, Halifax—The following three views, figs. 185, 186, and 187, illustrate some of the more important features of the "Campbell" engine. The oil is contained in a cistern *OC*, fixed on the top of the engine cylinder, and flows by gravity through a pipe *O*, to a circular chamber surrounding the inlet valve on the top of the vaporiser *V*; small holes lead from this circular chamber to the conical face of the inlet valve. This valve is automatic in its action and opens when the piston makes a suction stroke—provided the exhaust valve *E* is then closed, the oil can then flow through past the valve into the vaporiser; at the same time, air also

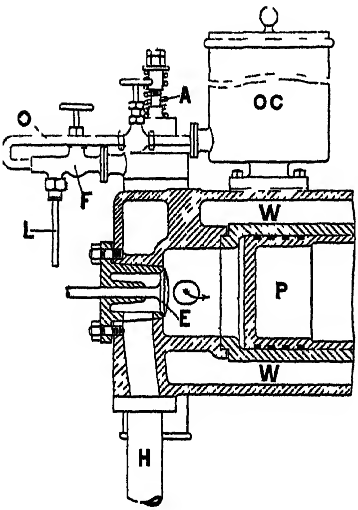


Fig. 185.—*Vertical section.*

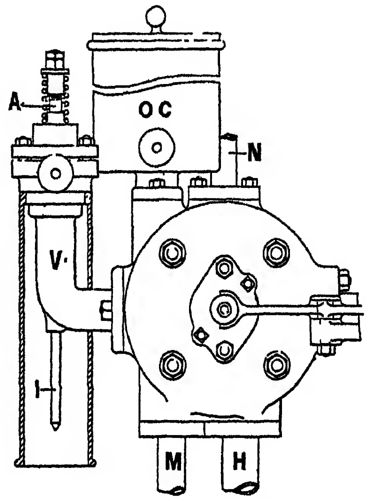


Fig. 187.—*End view, with part of vaporiser casing removed.*

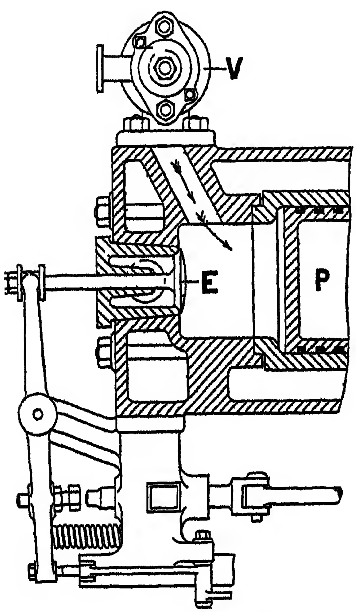


Fig. 186.—*Horizontal section.*

Figs. 185, 186, and 187.—*Sections through end of cylinder in "Campbell" Oil-Engine.*

V Vaporiser.	I Ignition tube.
OC Oil-cistern	H Exhaust pipe.
O Oil supply-pipe	M Water inlet pipe (jacket)
F Oil-cock.	N Water outlet pipe (jacket)
L Oil supply-pipe to vaporiser lamp	W Water jacket.
A Stem of air and oil inlet valve	P Piston.
E Exhaust valve.	

is drawn in, and spreads or sprays the oil against the heated sides of the vaporiser. The oil, thus completely vaporised and mixed with sufficient air to form an explosive mixture, is drawn into the cylinder, and finally ignited at the end of the compression stroke through contact with the heated ignition tube *I*.

There are only two valves in this engine—the inlet and exhaust; the latter is operated through a lever and side rod by an eccentric from the crank-shaft. Each valve is fitted in a loose box, cone-shaped on the outside and ground into its place; this type of fitting makes a good joint, and the boxes are easily removed and returned when required for cleaning purposes.

The vaporiser and ignition tube are heated at the same time by a lamp which is fed from the main oil-cistern through a pipe *L*; the lamp will burn whether the engine is working or standing, provided there is oil in the cistern. An ordinary centrifugal governor is used, which, when the speed increases above the normal, pushes down a steel catch and prevents the exhaust valve closing. This holding open of the exhaust valve destroys the vacuum formed in the cylinder during the suction stroke, and prevents the opening of the inlet valve, consequently no charge of oil is admitted to the vaporiser.

The "Campbell" oil-engine is simple in construction, and the workmanship in every respect is very good.

Messrs Robert Stephenson & Co., Ltd., Newcastle-on-Tyne.—The general arrangement of valves, vaporiser, &c., in the "Rocket" oil-engine is shown in figs. 188, 189, and 190, which represent respectively a side elevation, plan, and end elevation. The oil is led from a barrel or other convenient receptacle to a levelling chamber *L*, fitted with a ball top which keeps the supply of oil always at the same level. The charge of oil is drawn, on the suction stroke of the piston, from the levelling chamber through a small pipe into the vaporiser *V* (the oil cannot flow into the vaporiser as it lies at a slightly lower level in *L* than where it enters the vaporiser). Air is admitted through the pipes *F* and *H*, and, in combination with the vaporised oil, forms an explosive mixture which enters the cylinder through an inlet valve *A*. At the end of the compression stroke ignition is brought about in the usual way by means of a heated tube *I* screwed into the end of the combustion chamber; the ignition tube and vaporiser are heated by the same lamp.

The exhaust valve *E* and inlet valve *A* are kept on their seats by tension springs, and are opened at the proper moment by levers operated by cams on the side shaft.

The speed is controlled by a centrifugal governor, which acts either on the oil supply at *L* or on the vapour after it leaves the vaporiser.

All pipes, &c., subjected to heat and wear are standard gas and steam fittings, and can thus be easily replaced whenever necessary.

This engine is no doubt simple in its construction and working, and should give much better results than were obtained during the above trials

Messrs Blackstone & Co., Ltd, Stamford — Messrs Blackstone & Co were represented by three engines of 5, 8, and 14 declared brake horse-power respectively. The details of construction of

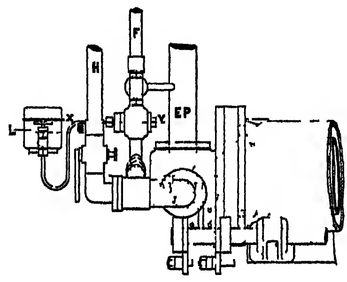


Fig 188 — *Side elevation*

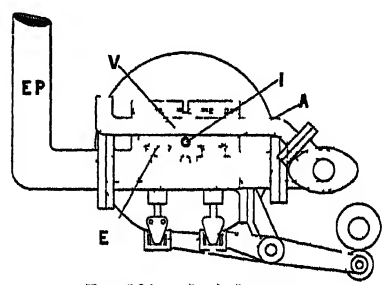


Fig 190 — *End elevation*

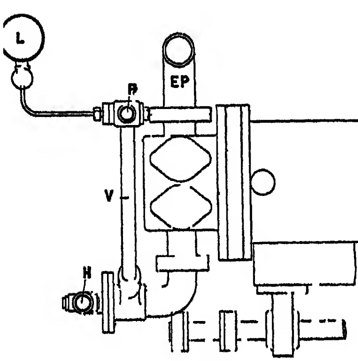


Fig 189 — *Plan*

Figs 188, 189 and 190 — *Arrangement of valves, vaporiser, &c in the "Stephenson" Oil Engine*

V Vaporiser	H H Air pipes
F Oil-feeding chamber	EP Exhaust pipe
I Ignition tube	MN Level of oil in ...
A Inlet valve	XX Centre line of oil sprayer
E Exhaust valve	

each engine are practically the same, and fig 191 shows a vertical section through the vaporiser, and valves, &c

The oil to be used for motive power is contained in a tank forming the foundation of the engine, it is pumped from this tank and delivered to an oil-tube *G* at the top of the vaporiser; the upper part of *G* is glass, in order that the oil-feed to vaporiser may be observed. The oil-pump has duplicate suction and delivery valves to ensure its more certain action

The cap of the vaporiser is provided with a series of passages *H* for the purpose of heating air which enters at *A*. The oil,

together with the heated air, is first drawn into an annular vaporising space *AVS*, and finally into the cylinder through a vapour valve *VV*. The vapouriser is heated internally by means of a lamp flame which enters at *L*. The vaporiser lamp is automatically fed from an oil-container, in which sufficient oil to last from six to eight hours is stored under air pressure (produced by a small hand-pump). Feeding the lamp under pressure is no doubt safer than a gravitation feed, and the lamp should give more satisfactory results.

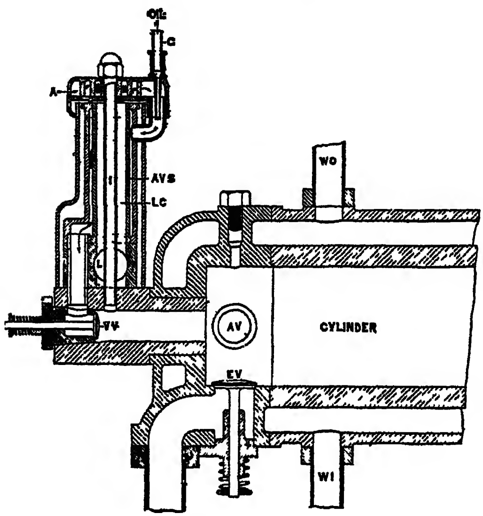


Fig. 191.—*Section through vaporiser and valves in the "Blackstone" Oil-Engine.*

AV Air-inlet valve.	LC Lamp chimney.
EV Exhaust valve.	L Lamp hole
VV Vapour valve.	G Glass tube to sight feed oil-delivery.
A Air inlet to vaporiser.	WI Water inlet.
H Air-heater channels.	WO Water outlet.
AVS Annular vaporising space.	
I Ignition tube.	

The ignition tube *I* is fitted at the top with a screw-cap which can be readily removed and the ignition tube cleaned. The air valve *AV* is automatic, while the exhaust valve *EV* and the vapour valve *VV* are operated from the side shaft in the usual manner.

The governor gear, which regulates the speed by cutting out one or more charges, may be readily adjusted—to increase or decrease the speed—whilst the engine is running.

For good workmanship, general neatness of design, and easy working, the engines exhibited by this firm left little to be desired.

Messrs Tangyes, Ltd., Birmingham.—The "Tangye" oil-engine exhibited ($17\frac{1}{2}$ brake horse-power) embodied Pinkney's patents. The arrangement of vaporiser, oil-supply, &c., is shown in side elevation in fig. 192.

The supply of oil for working the engine is contained in a tank fixed on the top of the cylinder and fitted with an arrangement similar to a fowl's drinking-vessel, whereby an automatic and even supply of oil to the engine is ensured no matter what amount of oil may be contained in the supply-tank. The oil

passes through a pipe and cock to the air-inlet valve, which is situated on the top of the vaporiser. The inlet valve is automatic in its action and is provided with a broad seat which admits of a small oil-inlet hole, as shown in fig. 193. On the suction stroke of the piston, air and oil will be drawn through the inlet valve—the oil in its passage being split up into fine particles and afterwards vaporised as it passes through the heated vaporiser into the cylinder. The vaporiser, which is surrounded by a cowl to better concentrate the heat, is heated by means of a simple wickless lamp or lamps—according to the size of engine and the conditions under which it may be

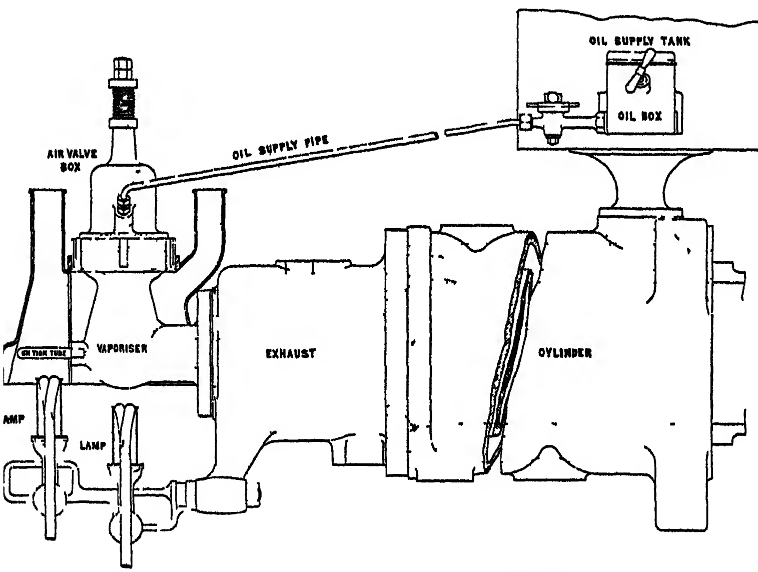


Fig. 192.—*Elevation, showing arrangement of vaporiser, oil-supply, &c., in the "Tangye" Oil Engine.*

working. The ignition tube is fixed at the extreme end of the bulb of the vaporiser, and is heated by one of the above-mentioned lamps. After the engine has been running for a short time, the lamp under the vaporiser may be put out. The oil for supplying the lamps is contained in a small tank fixed against the engine-room wall at a height of about 8 to 10 feet above floor-level, and connected to the lamps by means of a small flexible tube.

The exhaust valve, which is operated by the ordinary cam-and-lever mechanism off the side shaft, is placed in a box fixed to the side of the back cover.

The governing of the engine is effected by a simple incline or inertia governor, which operates a lever so as to keep open the exhaust valve when the ordinary working speed of the engine is exceeded. The holding open of the exhaust valve prevents the suction of the piston from opening the inlet valve and the admission of oil and air into the vaporiser. There are only two valves in this engine.

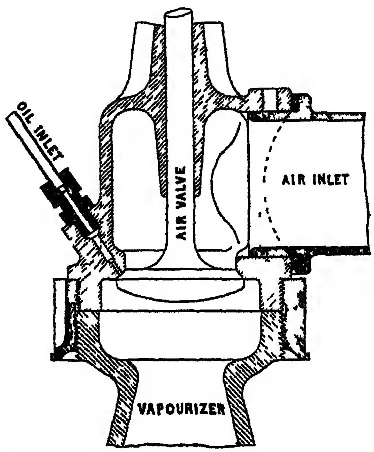


Fig. 193.—*Section, on enlarged scale, through air valve box in the "Tangye" Oil-Engine.*

The "Tangye" engine is simple and substantial in construction, and the workmanship excellent.

Messrs Pollock, Whyte, & Waddel, Johnstone, N.B.—This firm was represented by one of their 10 brake horse-power "Globe" oil-engines. The general arrangement of the vaporiser and valves in this engine is illustrated in figs. 194 and 195. The oil, which is contained in a tank separate from the engine, is fed by gravity through an oil-inlet cock *F* and oil-inlet valve *O V* into the vaporiser *V*. The opening of the oil-inlet valve and the consequent admission of oil into the vaporiser is simultaneous with the opening of the vapour valve *D*. On the suction stroke of the piston—the vapour valve being open—the vaporised oil is drawn in the direction of the arrows (fig. 195), and mixes with air entering at *A* before passing into the cylinder through the inlet valve *IV*.

The governor *G* is a very simple one, of the incline or inertia type, and operates the oil-inlet and vapour valves with the same motion.

The lamp for heating the vaporiser and ignition tube *I* is placed immediately below *H* (fig. 194).

This engine is well designed, strongly built, simple, and the workmanship is very good.

Messrs R. Cundall & Sons, Ltd., Shipley.—An 8 brake horse-power "Cundall" engine was submitted for trial, and the chief features of this make of engine are illustrated in fig. 196.

The oil is contained in a tank forming the base of the engine, and is forced by means of a pump *P*, through pipes, to an oil-measurer *M*. This oil-measurer consists of a small cup, the upper part of which is fitted with a screw thimble, and by

raising or lowering this thimble the quantity of oil in the cup may be increased or diminished as required; this arrangement enables the charge of oil delivered to the vaporiser to be measured with considerable accuracy. Any surplus oil that flows over the edge of the measurer is returned to the supply tank in base. The oil is delivered through an oil-inlet valve *OV* into a neck or passage connecting the vaporiser *V* with an air-inlet valve *A*, which is opened by means of a lever and cam at the commencement of the suction stroke, thus allowing a small quantity of air, together with the charge of oil, to enter the vaporiser. The vaporised oil is drawn into the cylinder, where it is mixed with a further supply of air which is admitted through an automatic air valve. The opening of the oil valve is regulated by a centrifugal governor *G*.

The vaporiser and ignition tube *I* are heated by the lamp *L*, which is supplied with oil from the main pipe leading from the pump to the measurer; an air-vessel *AV* is attached to give a steady pressure and regular flow of oil at the lamp. During the trials the oil for supplying the lamp was fed by gravity from a small tank placed about 10 feet above the floor-level.

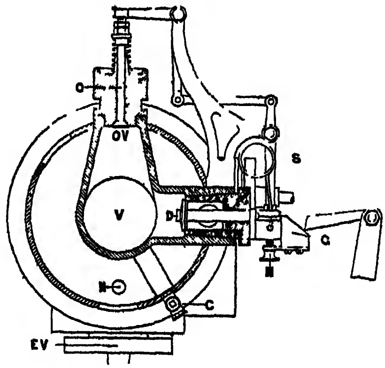


Fig. 194.—*Vertical section through vaporiser of the "Globe" Oil-Engine.*

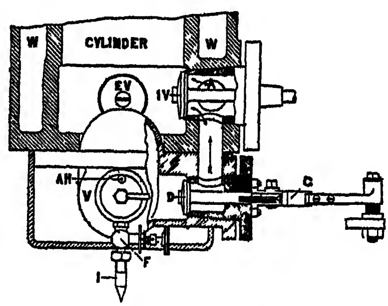


Fig. 195.—*Horizontal section through end of cylinder.*

Figs. 194 and 195.—*Sections through end of cylinder and vaporiser in the "Globe" Oil-Engine.*

V	Vaporising chamber	AH	Air-hole
D	Vapour valve	IH	Hole for ignition tube
EV	Exhaust valve.	I	Ignition tube
IV	Inlet (air and vapour) valve	G	Governor
OV	Oil inlet valve	W	Water jacket
O	Oil inlet	S	Spring for vapour valve
I	Oil inlet cock	N	Speed adjuster
C	Drip cock		
A	Air inlet		

The "Cundall" engine seems to be very well constructed; it is compact, and appears to work very satisfactorily.

Conditions of Trials

The engines were required to run for four hours on the first day at full declared brake-load This was followed on the second

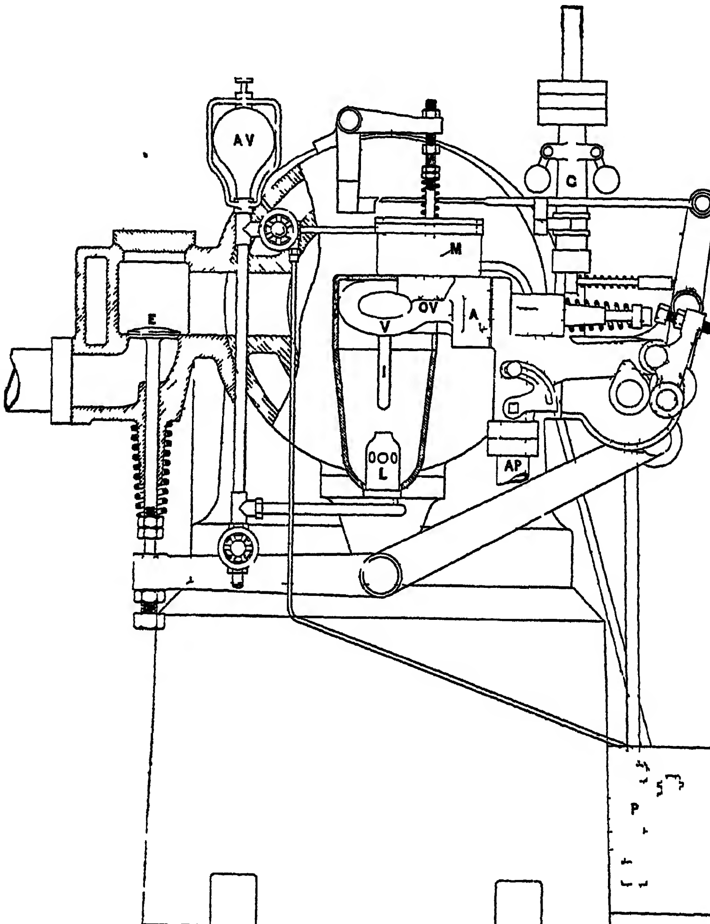


FIG 196 —*End elevation, partly in section, of the 'Cundall Oil Engine*

V Vaporiser	E Exhaust valve	L Lamp
OV Oil inlet valve	AV Air vessel to give steady flow to oil supplying lamp	I Ignition tube
M Oil measurer	AP Air pipe	P Oil pump
A Air inlet valve		G Governor

day by a two hours' run at half-load, afterwards by an hour's light load trial, finally, each engine was run for a short time at its maximum load This last trial was made in order to

ascertain the maximum power that could be developed on an emergency.

Each engine was required to start cold, and the time taken to bring up to full load was ascertained.

It was not considered essential that the engines should be fitted with indicator gear; several of the exhibitors, however, had provided suitable gear, and indicator diagrams were taken at regular intervals during the full-power trial.

Each engine was fitted with a suitable rope brake.

The speed and spring-balance readings were taken at regular and frequent intervals by a competent and trained staff. The spring-balances were all carefully tested and corrections made for any inaccuracy. The weights used for the dead-load on the brakes were also checked at the end of the trials.

The quantity of oil consumed by each engine was ascertained by weighing on a machine that had been carefully calibrated.

In all cases the weighings, measurements, readings, &c., were checked to prevent errors.

Description of Trials.

The large engines exhibited by Messrs Crossley Brothers and The Campbell Gas-Engine Co. were each provided with a starting apparatus, consisting of a steel receiver filled with waste gases under pressure. These receivers are charged by making communication with the engine cylinder for a short time while the engine is working, thus allowing some of the gases at a high pressure to be stored up for future use. These starters were allowed to be used for the full-power trials; in the subsequent trials the engines were started by hand in the usual manner.

The engines exhibited by The Campbell Gas-Engine Co., Messrs Stephenson & Co., Messrs Tangyes, Limited, and Messrs Pollock, Whyte, & Waddel, were provided with tanks or cisterns from which the oil flowed to engine by gravity. In the case of the engines supplied by Messrs Crossley Brothers, Messrs Blackstone & Co., and Messrs R. Cundall & Sons, the oil is contained in tanks forming the base of the engines.

In the Crossley engine the oil (engine and lamp) was pumped direct from the tank in the base of the engine, a float gauge being fitted to indicate the level of oil in the tank, and the duration of the trial was determined by the time taken to consume a weighed quantity of oil.

Messrs Blackstone & Co. had arranged to draw the engine oil from buckets, which were weighed at the beginning and end of each trial; the oil for supplying the lamps was stored, in each case, under air pressure in small separate cylinders.

In the Cundall engine a point gauge was used to indicate the level of oil in the tank; at the conclusion of the trials oil was weighed into the tanks until the same level was attained as at the beginning.

The trials took place on July 1st and 3rd, previous to the opening of the Show on July 4th. A special shed was provided, and each exhibitor had ample space allotted.

A commencement was made about 11 A.M., July 1st; all the exhibitors were able to start, except Messrs R. Stephenson & Co. and Messrs R. Cundall & Sons. The latter firm was somewhat handicapped, as the engine originally intended for trial was not delivered by the railway company until too late to permit of its being erected in time to start with the rest, so permission was given to substitute another and smaller engine which was already on the ground. This alteration necessitated a somewhat later start, and the duration of the full-power trial was not quite so long as with the other engines.

Messrs R. Stephenson & Co.'s engine had been erected with the cylinder projecting beyond the shed, and on account of the heavy rain prevailing during the first day of the trial it was found exceedingly difficult to start—in fact no satisfactory run was made until the second day.

With the above exceptions all the engines started exceedingly well, and required very little manual effort to get them under way.

The Campbell large engine slowed down for a few minutes during the full-power trial, owing to the cylinder lubricating gear being inadvertently thrown out of action by the indicator cord; afterwards the engine ran satisfactorily, considering that it had not previously been working for any length of time: the piston seemed to be a little tight in the cylinder. Messrs Stephenson's engine was evidently in the experimental stage, and did not work as satisfactorily as expected; this fact probably accounts for the rather excessive oil consumption during the trials.

With these two exceptions all the engines worked exceedingly well, and the combustion of the oil appeared to be practically complete; the exhaust from each engine was very clear even when running light.

As a concluding test, each engine was required to be loaded up until its maximum power was developed with a constant speed, and run for about twenty minutes.

There was no case of bearings heating during the trials.

The engines were afterwards opened up in presence of the Committee for inspection, and all were found practically free from fouling of any description.

The results of the various trials are given in the following tables:—

FULL POWER TRIAL. *July 1st and 3rd*, 1899.

Engines	Crossley Brothers, Ltd.	Campbell Gas-Engine Co.	Campbell Gas Engine Co.	R. Stephenson & Co	Blackstone & Co.	Blackstone & Co.	Blackstone & Co.	Tangyes, Ltd	Pollock, Whyte, & Waddel.	R. Cundall & Sons.
Duration of trial, hours	3·762	4	4	1·266	4	4	4	4	4	2
Time taken to start, full load, minutes	18¼	31	14	10	11	10	16	15	13½	11
Brake Horse-power.										
Circumference of fly-wheel (effective), ft.	11·322	17·586	15·952	14·214	10·936	14·040	17·529	16·022	15·845	14·372
Load on brake, lb.	224·5	204	147	41	70	98	168	204·75	112	96·25
Spring-balance reading, lb.	3	15	11·37	12	8·55	10·3	43 4	18 82	11·5	7·54
Net load on brake, lb.	221·5	189	135·63	29	61·45	87 7	124·6	185 93	100·5	88·71
Revolutions per minute, mean	204	188	210	252	256	218	190·3	200·1	220·5	227·7
Brake horse-power	**15 5**	**18·93**	**13·87**	**3 14**	**5·21**	**8 13**	**12·6**	**18·06**	**10 64**	**8·77**
Indicated Horse-power.										
Diameter of cylinder, inches	10	12·5	9·5	7	6	7	9·5	11	10	8·75
Stroke, inches	18	21	18	12	12	14	18	16	13	15
Mean effective pressure, lb. per sq. inch	64·52	49·5	..	39 -	.	..	56	62·2	.	-
Explosions per minute, mean	87·25	76	...	118·5	.	...	81·4	89·75		.
Indicated horse-power	20·09	24·48		5·39		.	14·68	21·43	...	
Mechanical efficiency	·771	·773	..	·582			858	- ·842		
Oil consumption.										
Description of oil used in trials	Royal Daylight	Russolene	Russolene	Royal Daylight	Russolene	Russolene	Russolene	Russolene	Royal Daylight	Royal Daylight
Specific gravity	·793	·826	·826	·796	·825	·825	·825	·823	·797	·800
Total oil used, engine and lamp, lb.	46·25	90·97	58·99	6·5	17·375	27 125	37·625	58·25	49·25	16·875
Oil per I.H.P. per hour, lb.	·611	·928		·952	.		·640	·679		
Oil per B.H.P. per hour, lb.	**·793**	**1·200**	**1 06**	**1·63**	**·833**	**·836**	**·746**	**·806**	**1·15**	**·962**

HALF POWER BRAKE TRIAL. *July 3rd*, 1899.

Engines	Crossley Brothers, Ltd.	Campbell Gas-Engine Co.	Campbell Gas-Engine Co.	R. Stephenson & Co.	Blackstone & Co.	Blackstone & Co.	Blackstone & Co.	Tangyes, Ltd.	Pollock, Whyte, & Waddel.	R. Cundall & Sons.
Duration of trial, hours	1·75	2	2	2	2	2	2	2	2	1 875
Time taken to start, half load, minutes	15½	16	11	9	9	16½	10	13	16	7½
Brake Horse-power.										
Load on brake, lb.	112	112	70	24·625	35	49	84	104·62	56	48
Spring-balance reading, lb.	4·75	9·5	5·2	6·5	2	2·6	21·2	3·25	11·9	4
Net load on brake, lb.	107·25	102·5	64 8	18·125	33	46·4	62·8	101·37	44·1	44
Revolutions per minute, mean	210	194·3	215	168·2	260	245	197·6	202·2	221·6	227·3
Brake horse-power	7·71	10·59	6·73	1 31	2·84	4·84	6·59	9 95	4·69	4·35
Oil consumption.										
Total oil used, engine and lamp, lb.	14·00	31·04	15·97	7·56	6 25	9·95	13·5	18·7	21·5	12·18
Total oil used, per hour, lb.	8·00	15·52	7·985	3·78	3·125	4 975	6·75	9·35	10·75	6·496
Oil per B.H.P. per hour, lb.	1·037	1·466	1·186	2·88	1·099	1·03	1·024	·939	2·23	1·57

TRIAL OF ENGINES RUNNING LIGHT. *July 3rd*, 1899.

Engines	Crossley Brothers, Ltd.	Campbell Gas-Engine Co.	Campbell Gas-Engine Co.	R. Stephenson & Co.	Blackstone & Co.	Blackstone & Co.	Blackstone & Co	Tangyes, Ltd.	Pollock, Whyte, & Waddel	R Cundall & Sons
Duration of trial, hours	·93	1	1	1	1	1	1	1	1	1
Revolutions per minute, mean	213·5	195	218	190·5	265	230	202	207·4	216	227
Total oil used, engine and lamp, per hr., lb.	4·03	8 23	3·8	4·43	1·69	2·75	3·4	3·375	5·375	4·24

MAXIMUM POWER TRIAL. *July 3rd*, 1899.

Engines	Crossley Brothers, Ltd	Campbell Gas-Engine Co.	Campbell Gas-Engine Co.	R Stephenson & Co.	Blackstone & Co.	Blackstone & Co.	Blackstone & Co.	Tangyes, Ltd.	Pollock, Whyte, & Waddel	R Cundall & Sons.
Load on brake, lb.	273	274	161	50·625	84	119	252	226 125	203 5	126 25
Spring-balance reading, lb.	10·5	20·25	17	11	6	11	71	4·5	34	8·5
Net load on brake, lb.	262·5	253·75	144	39·625	78	108	181	221·625	169 5	117·75
Revolutions per minute, mean	200	189	214	184	258 5	232	205	192	244	207
Brake horse-power, maximum	18·01	25 55	14·89	3·14	6·68	10 66	19 7	20 66	19·85	10 54

SUMMARY OF TRIALS OF OIL-ENGINES.

Engines	Crossley Brothers, Ltd.	Campbell Gas-Engine Co.	Campbell Gas-Engine Co.	R. Stephenson & Co.	Blackstone & Co.	Blackstone & Co	Blackstone & Co.	Tangyes, Ltd.	Pollock, Whyte, & Waddel.	R. Cundall & Son.
Diameter of cylinder, inches	10	12½	9½	7	6	7	9⅓	11	10	8¾
Stroke, inches	18	21	18	12	12	14	18	16	18	15
Price of oil per gall., delivered Edin., pence	6½	6½	6½	6⅓	6⅓	6½	6⅓	6½	6⅓	6½
Full-power trial.										
Brake horse-power	15·5	18 93	13·87	3·14	5·21	8·13	12·6	18·06	10·64	8·77
Total oil used per hour, lb.	12·29	22·74	14·75	5·13	4·34	6·78	9·40	14·56	12·31	8 43
Oil per B.H.P. per hour, lb.	·793	1·20	1·06	1·63	·833	·836	·746	·806	1·15	·962
Cost per hour (total), pence	10·08	17·88	11·60	4·20	3·42	5·35	7·42	11·50	10·05	6·86
Cost per B.H.P. per hour, pence	·65	·94	·83	1·33	·656	·658	·588	·636	·938	·782
Half-power trial.										
Brake horse-power	7·71	10·59	6·73	1·31	2·84	4·84	6·59	9·95	4·69	4·35
Total oil used per hour, lb.	8·00	15·52	7·985	3·78	3·125	4·975	6·75	9 35	10·75	6·496
Oil per B.H.P. per hour, lb.	1·037	1·466	1·186	2·88	1·099	1·03	1·024	·939	2·23	1·57
Cost per hour (total), pence	6·56	12·22	6·28	3·08	2·46	3·92	5·32	7·38	5·77	5·27
Cost per B.H.P. per hour, pence	·85	1·152	·933	2·35	·865	·812	·807	·741	1·82	1 275
Light trial.										
Total oil used per hour, lb.	4·03	8·23	3·8	4·43	1 69	2·75	3·4	3·375	5·375	4·24
Cost per hour, pence	3·30	6·47	2·99	3·62	1·33	2·17	2·68	2·67	4·38	3·44
Maximum-power trial.										
Brake horse-power	18·01	25·55	14 89	3·14	6·68	10·66	19·7	20·66	19·85	10·54

Thermal Efficiency of Oil-Engines.

In order to obtain a satisfactory knowledge as to the relative merit of the various oil-engines that were submitted for trial, it is necessary, in each case, to compare the actual work done by the engine with the heat supplied. The consumption of oil in each engine has been determined per brake or actual horse-power per hour, and the *thermal* or *heat efficiency* is here taken to represent the ratio of the actual work done by the engine at the brake in a given time—33,000 foot-pounds or 42·63 heat units per minute—to the total heat supplied per minute by the complete combustion of the oil required to do that work, thus :—

$$\text{Thermal efficiency (actual)} = \frac{\text{Work done per minute (42·63 heat units).}}{\text{Heat supplied per B.H.P. per minute.}}$$

Note—One horse-power = 33,000 foot-pounds per minute.
" " = 42·63 heat units " "
One British heat unit is here taken as being equivalent to 774 foot-pounds.
A British thermal or heat unit is the quantity of heat required to raise the temperature of 1 lb. of water 1° Fahr.

As already mentioned, only two descriptions of oil were used — viz., "Royal Daylight" (specific gravity ·800) and "Russolene" (specific gravity ·825). Through the courtesy of Mr Chas. J. Wilson, F.I.C., 14 Old Queen Street, Westminster, London, who has had a very considerable experience in the testing of petroleum, &c., it has been possible to obtain the calorific or heat values of oils similar in composition and specific gravity to the above, as deduced from numerous samples examined from time to time by Mr Wilson. It is, of course, possible that any particular sample used during the trials might be slightly different, but it is not likely that there is any serious discrepancy, as these oils are, as a rule, fairly constant in composition.

Description of oil.	Specific gravity.	Calorific value per pound. Heat units.
"Royal Daylight"	·800	18,720
"Russolene"	·825	18,630

That is, 18,720 heat units would be developed by the complete combustion of 1 lb. of "Royal Daylight" oil.

The following actual example, taken from the results of the full-power trial of Messrs Crossley Brothers' engine, will indicate the method of finding the *thermal efficiency* :—

$$\text{Total oil used per B.H.P.} \begin{cases} \text{per hour} & = \cdot 793 \text{ lb.} \\ \text{per minute} & = \cdot 0132 \text{ lb.} \end{cases}$$

$$\text{Heat supplied per B.H.P. per minute} \begin{cases} = \cdot 0132 \times 18{,}720. \\ = 247 \text{ heat units.} \end{cases}$$

$$\text{Thermal efficiency (actual)} = \frac{42 \cdot 63}{247} = \cdot 173 \text{ or } 17 \cdot 3 \text{ per cent.}$$

This particular engine, as tested, was therefore capable of converting 17·3 per cent of the heat produced by the combustion of the oil into actual work at the brake; the above result is really a very good performance.

In the following table the different engines have been arranged in order of merit of thermal efficiency:—

Exhibitor.	Declared brake horse-power.	Brake horse-power developed on full-power trial.	Total oil used per B.H.P. per hour, lb.	Heat units supplied per B.H.P. per minute.	Thermal efficiency (per cent).
Messrs Blackstone & Co. . .	14	12·6	·746	231	18·5
" Crossley Brothers . .	16	15·5	·793	247	17·3
" Tangyes, Ltd.	17·5	18·06	·806	250	17·1
" Blackstone & Co. . .	5	5·21	·833	259	16·5
" Blackstone & Co. . .	8	8·13	·836	260	16·5
" R. Cundall & Sons . .	8	8·77	·962	300	14·2
The Campbell Gas-Engine Co. .	13	13·87	1·060	329	12·9
Messrs Pollock, Whyte, & Waddel	10	10·64	1·150	358	11·9
The Campbell Gas-Engine Co. .	20	18·93	1·200	372	11·5
Messrs R. Stephenson & Co. . .	5	3·14	1·630	508	8·4

The above results are probably about three times the thermal efficiency of a good steam-engine and boiler of equal power, and indicate that the majority of the engines worked exceedingly well and economically.

R. STANFIELD, *Engineer.*
JONATHAN MIDDLETON,
GEORGE R. GLENDINNING,
JOHN M'HUTCHEON DOBBIE,
JOHN SPEIR,
Members of Committee.

TRIAL OF MANURE-DISTRIBUTORS.

An exhibition of manure-distributors at work was held by the Society on Friday, 15th September, on a field on the farm of Granton Mains, Edinburgh, kindly granted for the occasion by the tenant, Mr R. B. Macdonald.

Twelve machines were entered as follows, viz.:—

No. 1. Messrs Auchinachie & Simpson, Keith, Banffshire. "The Jubilee" broadcast manure-distributor, right and left screw stirring disc delivery motion, sowing 9 feet wide. Price £12, 12s.

Nos. 2 and 3. Messrs Alexander Jack & Sons, Maybole, Ayrshire. (2) Combined drill and broadcast distributor, with chain delivery, sowing 8 feet wide. Price £16, 10s. (3) Combined drill and broadcast distributor, with disc delivery. Price £16, 15s.

No. 4. Messrs Macdonald Brothers, Portsoy, Banffshire, per Messrs A. & J. Main, Edinburgh. "Triumph" broadcast manure-distributor, with rotatory shaft, sowing 9 feet wide. Price £12.

No. 5. Messrs Milne & Macdonald, Lockerbie. Broadcast distributor, with delivery shaft, sowing a width of about 6 feet. Price £12.

Nos. 6 and 7. Messrs Ben. Reid & Co., Aberdeen. (6) Broadcast distributor, with chain delivery, sowing 8 feet wide. Price £16, 10s. (7) Three-row distributor. Price £14.

No. 8. Messrs Sargeant & Co., Limited, Northampton. "Revolution" distributor, sowing a width of about 7 feet. Price £20.

No. 9. Messrs T. Sherriff & Co., West Barns, Dunbar. Drill or broadcast distributor, with chain delivery, sowing a width of 9 feet, or four drills 27 inches wide. Price £14.

No. 10. Mr T. Turnbull, Dumfries. Drill or broadcast distributor (Davidson's Patent), delivery by rotating arms, sowing a width of about 14 feet. Price £15.

No. 11. Messrs J. & R. Wallace, Castle-Douglas. Combined drill and broadcast distributor, disc delivery, sowing a width of about 15 feet. Price £16.

No. 12. Messrs R. Wallace & Son, Whitletts, Ayr. Combined triple drill and broadcast distributor, disc delivery, sowing a width of about 15 feet. Price £16.

The field on which the trial was held was well suited for the purpose. A crop of potatoes had just been lifted from it. The land had been stirred with the cultivator; about one-third of it was harrowed and rolled, and the remainder merely harrowed. The ground was marked off into plots of about half an acre for each machine, so that each machine was worked on both rolled and unrolled land. Strips of canvas were laid down on each plot to show more clearly the distribution of the dark-coloured manures.

The manures used in the trials were as follows—viz.: (1) basic slag, sown at the rate of 5 cwt. per acre; (2) bone-meal, sown at the same rate; (3) compound manure, consisting of superphosphate, kainit, and common salt (to represent sulphate

of ammonia), sown at same rate; (4) superphosphate, sown at same rate; (5) common salt (to represent nitrate of soda), sown at the rate of about 2 cwt. per acre; and (6) dissolved bones, sown at the rate of 5 cwt. per acre.

Unfortunately the weather during the day of the trial was exceedingly inclement. A strong wind blew across the field the entire day, and rain fell almost constantly, at times very heavily. The trial was thus carried through under disagreeable and untoward circumstances. The proceedings were watched with much interest by a good many farmers, but the attendance would no doubt have been much larger had the weather been more favourable.

With the view of providing a severe test, the dissolved bones were supplied in a soft, clammy, lumpy condition. All the other manures were supplied in fairly dry condition, but by the continuous rain they were moistened somewhat during the trial. The condition of the manures, therefore, combined with the wind and rain to provide an exceptionally severe ordeal for the machines.

In view of these untoward circumstances it is not surprising that in several instances the work was done in an unsatisfactory manner. In the strong wind, which blew across the field, the disc-delivery machines were placed at a great disadvantage, and as a rule were not successful. It was found difficult to determine the width they were sowing; but it could be seen that fine material, such as basic slag, was sown over a narrower surface than coarser material, such as bone-meal and salt. With the compound manure some of these disc-delivery machines did good work; and they are much easier cleaned, less complicated, and less liable to choke than the machines with the chain or shaft delivery. In calm weather the best of the disc machines might be expected to do good work with all the ordinary manures.

As might have been expected with the strong wind, the best work was done by the machines with chain-and-shaft delivery. The chain delivery had the advantage all over, and it was unquestionably improved by the assistance of a stirring shaft moving above the chain, as in Nos. 2 and 6. Distribution by shaft alone, as in Nos. 1 and 4, was scarcely equal to that by chain alone (No. 9), and was markedly inferior to the work done by chain and shaft combined (Nos. 2 and 6). With the dry manures the shaft worked fairly well, but was not a success with the soft materials. The shaft arrangement in No. 5 worked, on the whole, fairly well, especially with salt, bone-meal, and the compound manure. No. 8 is too complicated in its construction, and too costly; but it distributed the soft clammy manures efficiently. Messrs Sargeant & Co. had a

second machine on the ground. It was not entered in the catalogue, but was included in the trial. It is an ingenious machine, well adapted for dry manures, but not suited for soft materials. It did specially good work with basic slag. No. 9 distributed the salt well, but was only fairly satisfactory with the other materials. No. 10 was not successful, the strong wind being much against its method of distribution. Nos. 11 and 12 are simple, easily worked machines, which would, no doubt, do very good work in calm weather.

In no case was more than one horse required for the working of the machine.

Taking the machines in the order of the catalogue, the most satisfactory work was, on the whole, done by Nos. 2, 6, 11, and 12. No. 6 succeeded fairly well with all the materials tried; but, as in the case of nearly all the machines, the price seems high. Even with the best of the machines the distribution was not so regular as is desired by farmers, and this applies to all systems of delivery. All things considered, however, the trial was successful from a practical point of view, and may be calculated to interest agriculturists and to stimulate manufacturers in the further improvement of their machines.

JONATHAN MIDDLETON. JOHN WILSON.
GEORGE R. GLENDINNING. JAMES BIGGAR.
JAMES HOPE. R. STANFIELD.

PREMIUMS AWARDED BY THE SOCIETY IN 1899.

Professor J. COSSAR EWART, Edinburgh, for Zebra and Zebra Hybrids and Experiments in Stock-breeding—Large Gold Medal.

EDINBURGH SHOW

4th, 5th, 6th, and 7th July 1899

Abbreviations.—V., *Very Highly Commended.* H., *Highly Commended.* C., *Commended.*

CATTLE

SHORTHORN.

PRINCE OF WALES GOLD MEDAL for best Shorthorn.

No. 6. Alex. M. Gordon of Newton, Insch, "Corner Stone" (68,406).

The Tweeddale Gold Medal, value £20, for best Shorthorn Bull.

No. 6. Alex. M. Gordon of Newton, Insch, "Corner Stone" (68,406).

Breeder of best Bull of any age in Classes 1, 2, *and* 3—Silver Medal.

No. 6. Alex. M. Gordon of Newton, Insch.

Class 1. BULL, calved before 1897.—Premiums, £15, £10, £5, and £3.

1st. No. 6. Alex. M. Gordon of Newton, Insch, "Corner Stone" (68,406).
2nd. No. 5. Sir John Gilmour of Lundin and Montrave, Bart., Leven, "Brave Archer" (70,018).
3rd. No. 21. H.R.H. The Prince of Wales, K.G., Sandringham, Norfolk, "Stephanos" (71,688).
4th. No. 11. Messrs Law, Mains of Sanquhar, Forres, "Christmas Cup" (70,155).
V. No. 17. Wm. A. Mitchell, Auchnagathle, Whitehouse, Aberdeen, "Nobility."
H. No. 10. George Harrison, Gainford Hall, Darlington, "Lieutenant" (72,835).
C. No. 1. William Bell, Ratcheugh, Alnwick, "Baron Alnwick" (66,918).
C. No. 3. F. W. Christie, Dairsie Mains, Cupar-Fife, "Moonlight."
C. No. 13. Wm. T. Malcolm, Dunmore Home Farm, by Larbert, "Marksman" (70,945).
C. No. 16. J. & A. Milne, Nether Cairn Mill, Muchalls, "Murillo" (71,054).

Class 2. BULL, calved in 1897.—Premiums, £15, £10, £5, and £3.

1st. No. 27. George Harrison, Gainford Hall, Darlington, "Count Beauty" (72,267).
2nd. No. 39. Her Majesty The Queen, Royal Shaw Farm, Windsor, "Matchless" (73,031).
3rd. No. 44. Robert Taylor, Pitlivie Farm, Carnoustie, "Merry Merlin" (73,068).
4th. No. 38. Lord Polwarth, Mertoun, St Boswells, "Mosstrooper."
V. No. 34. James M'William, Stoneytown, Keith, "Pride of Fame" (73,238).
H. No. 40. A. Robertson, Ballechin, Ballinluig, "Mountain Hero" (73,114).
C. No. 25. Walter R. Crawford, The Priory, Tullyhogue, Co. Tyrone, Ireland, "Woodland King."

C.	No. 26.	J. Maxtone Graham, Battleby, Redgorton, "Prince of Masters" (73,305).
C.	No. 30.	Messrs Law, Mains of Sanquhar, Forres, N.B., "Diamond Jubilee" (72,341).

CLASS 3. BULL, calved in 1898.—Premiums, £12, £8, £4, and £2.

1st.	No. 56.	Her Majesty The Queen, Royal Shaw Farm, Windsor, "Royal Duke."
2nd.	No. 48.	James Durno, Jackston, Rothienorman, "Pride of Collynie."
3rd.	No. 49.	George Harrison, Gainford Hall, Darlington, "Favourite of Sanquhar."
4th.	No. 58.	C. Home Graham Stirling of Strowan, Crieff, "Bright Star."
V.	No. 50.	James M'William, Stoneytown, Keith, "Sir Walter."
H.	No. 55.	George H. Procter, Flass House, Durham, "Fairy Beau."
C.	No. 52.	Colonel Munro, Mains of Murthly, Aberfeldy, Perthshire, "Sirdar."
C.	No. 57.	A. Robertson, Ballechin, Ballinluig, "Newton Stone."
C.	No. 59.	C. Home Graham Stirling of Strowan, Crieff, "Strowan Butterfly VIII."

Best Female of any age in Classes 4, 5, *and* 6—£20, given by the Shorthorn Society.

No. 107. Her Majesty The Queen, Royal Shaw Farm, Windsor, "Cicely."

CLASS 4. COW, of any age.—Premiums, £12, £8, £4, and £2.

1st.	No. 64.	George Harrison, Gainford Hall, Darlington, "Welcome."
2nd.	No. 62.	Mrs A. H. Browne, Callaly Castle, Whittingham, R.S.O., Northumberland, "Callaly Jean."
3rd.	No. 61.	William Bell, Ratcheugh, Alnwick, "Lady Clara 3rd."
4th.	No. 71.	Colonel Munro, Mains of Murthly, Aberfeldy, Perthshire, "May Blossom 3rd."
V.	No. 72.	Lord Polwarth, Mertoun, St Boswells, "Lady Beatrice."
H.	No. 66.	George Longmore, Rettie, Banff, "Queen of Hearts."
C.	No. 65.	George Inglis, Newmore, Invergordon, "Violet."

CLASS 5. HEIFER, calved in 1897.—Premiums, £10, £5, £3, and £2.

1st.	No. 74.	C. M. Cameron, Balnakyle, Munlochy, Ross-shire, "Lady 17th."
2nd.	No. 78.	William Heaton, Lostock, Bolton, Lancashire, "Daisy 4th."
3rd.	No. 77.	George Harrison, Gainford Hall, Darlington, "Fairy Queen."
4th.	No. 76.	Joseph Harris, Calthwaite Hall, Carlisle, "Empress 12th."
V.	No. 73.	William Bell, Ratcheugh, Alnwick, "Comely."
H.	No. 84.	A. Robertson, Ballechin, Ballinluig, "Tulip Blossom."
C.	No. 79.	John Hill, Langside, Kennoway, "Bridesmaid."
C.	No. 81.	Messrs Law, Mains of Sanquhar, Forres, "Actress 5th."

CLASS 6. HEIFER, calved in 1898.—Premiums, £10, £5, £3, and £2.

1st.	No. 107.	Her Majesty The Queen, Royal Shaw Farm, Windsor, "Cicely."
2nd.	No. 110.	Robert Taylor, Pitlivie Farm, Carnoustie, "Princess of Pitlivie."
3rd.	No. 97.	George Harrison, Gainford Hall, Darlington, "Welfare."
4th.	No. 95.	George Harrison, Gainford Hall, Darlington, "Sweet Adelaide."
V.	No. 111.	Robert Taylor, Pitlivie Farm, Carnoustie, "Maggie Undine 9th."
H.	No. 100.	George Longmore, Rettie, Banff, "Pavonia."
C.	No. 93.	Sir John Gilmour of Lundin and Montrave, Bart., Leven, "Annie Wenlock."
C.	No. 108.	A. Robertson, Ballechin, Ballinluig, "Juno."

ABERDEEN-ANGUS.

PRINCE OF WALES GOLD MEDAL for best Aberdeen-Angus Animal.

No. 126. Geo. Smith Grant, Auchorachan, Glenlivet, Ballindalloch, Bull, "Equestrian" (9953).

Best Bull of any age in Classes 7, 8, *and* 9—Ballindalloch Challenge Cup, value £50, given by the late Mr Macpherson Grant of Drumduan.

No. 115. Sir George Macpherson Grant, Bart., The Castle, Ballindalloch, "Prince Ito" (12,869).

Breeder of the Winner of the Ballindalloch Challenge Cup—Silver Medal.

Sir George Macpherson Grant, Bart.

Breeder of best Bull of any age in Classes 7, 8, *and* 9—Silver Medal.

No. 115. Sir George Macpherson Grant, Bart., The Castle, Ballindalloch.

Best Animal of the Breed in Classes 7, 8, *and* 9—Champion Gold Medal, given by the Polled Cattle Society.

No. 115. Sir George Macpherson Grant, Bart., The Castle, Ballindalloch, "Prince Ito" (12,869).

CLASS 7. BULL, calved before 1st December 1896.—Premiums, £15, £10, £5, and £3.

1st. No. 115. Sir George Macpherson Grant, Bart., The Castle, Ballindalloch, "Prince Ito" (12,869).
2nd. No. 121. Colonel F. Morison of Bognie, Mountblairy, Turriff, "Eunotus" (13,399).
3rd. No. 116. Geo. Smith Grant, Auchorachan, Glenlivet, Ballindalloch, "Quintus M 2nd" (13,888).
4th. No. 117. Thomas F. Inkson, Kinermony, Aberlour, Strathspey, "Jim of Morlich" (13,531).
V. No. 114. Edward Coey, Droagh Farm, Larne, "Baron Inca" (13,160).
H. No. 119. Alexander M'Laren, Auchnaguie, Tullymet, Ballinluig, "Delamere" (13,305).
C. No. 120. Sir Robert D. Moncreiffe of Moncreiffe, Bart., Bridge of Earn, "Clansman of Fordie" (12,363).
C. No. 124. Clement Stephenson, Sandyford Villa, Newcastle on-Tyne, "Best Man of Benton" (13,173).

CLASS 8. BULL, calved on or after 1st December 1896.—Premiums, £15, £10, £5, and £3.

1st. No. 127. William Shaw Adamson, Careston Castle, Brechin, "Diaz" (14,272).
2nd. No. 131. The Earl of Rosebery, K.G., Dalmeny Park, Edinburgh, "Plutocrat of Dalmeny" (14,800).
3rd. No. 132. Archibald Whyte, Inverquharity, Kirriemuir, N.B., "Rover of Laughton" (14,942).
4th. No. 130. Her Majesty The Queen, Abergeldie Mains, Ballater, "Juryman of Whitelums."
V. No. 128. Sir Thomas D. Gibson-Carmichael, Bart., M.P., of Castle Craig, Dolphinton, "Ganymede of Ballindalloch" (14,428).
H. No. 129. Charles Edward Hunter, Selaby, Gainford, "Crowbar" (14,233).

CLASS 9. BULL, calved on or after 1st December 1897.—Premiums, £12, £8, £4, and £2.

1st. No. 140. Hugh Wilson, Milton of Noth, Rhynie, Aberdeenshire, "Hengist of Pitpointie" (15,535).
2nd. No. 134. Sir T. D. Gibson-Carmichael of Castle Craig, Bart., M.P., Dolphinton, "Burnatum" (15,248).
3rd. No. 135. Donald M. Macrae, Stenhouse, Thornhill, Dumfries, "Roving Lad" (16,011).
4th. No. 138. Her Majesty The Queen, Abergeldie Mains, Ballater, "Baron Kerrera" (15,161).
V. No. 136. Arthur J. Owen, Shanvaghey, Ballacolla, Queen's County, "Ninety-eight" (15,803).
H. No. 133. Robert Forbes, Woodhead, Kinloss, Forres, "Interdick" (15,560).
C. No. 137. Arthur J. Owen, Shanvaghey, Ballacolla, Queen's County, "Mellibus 3rd" (15,741).

Best Cow of any age in Class 10—Ballindalloch Challenge Cup, value £50, given by the late Mr Macpherson Grant of Drumduan.

No. 153. Thomas Smith, Powrie, Dundee, "Petalite" (22,270).

Breeder of the Winner of the Ballindalloch Challenge Cup—Silver Medal.

Alexander Simpson, Kirkside, Banff.

CLASS 10. COW, of any age.—Premiums, £12, £8, £4, and £2.

1st. No. 153. Thomas Smith, Powrie, Dundee, "Petalite" (22,270).
2nd. No. 151. Mrs Cambridge Grubb, Killneton House, Dunmurry, Co. Antrim, "May Empress" (24,445).
3rd. No. 156. Clement Stephenson, Sandyford Villa, Newcastle-on-Tyne, "Elite of Benton" (24,772).
4th. No. 148. Sir George Macpherson Grant, Bart., The Castle, Ballindalloch, "Elixir" (21,809).
V. No. 157. George Willsher, Pitpointie, Auchterhouse, Dundee, "Black Victoria" (23,461).
H. No. 147. Sir T. D. Gibson-Carmichael of Castle Craig, Bart., M.P., Dolphinton, "Pride of Knocknowes" (22,945).
C. No. 145. Robert Forbes, Woodhead, Kinloss, Forres, "Quality of Kinloss" (25,394).
C. No. 149. Sir George Macpherson Grant, Bart., The Castle, Ballindalloch, "Gardenia" (22,997).
C. No. 150. Sir George Macpherson Grant, Bart., The Castle, Ballindalloch, "Mantua of Ballindalloch" (23,002).
C. No. 152. Her Majesty The Queen, Abergeldie Mains, Ballater, "Princess Irene 6th" (22,586).
C. No. 158. George Willsher, Pitpointie, Auchterhouse, Dundee, "Princess Favonia" (22,746).

CLASS 11. HEIFER, calved on or after 1st December 1896.—
Premiums, £10, £5, £3, and £2.

1st. No. 165. Clement Stephenson, Sandyford Villa, Newcastle-on-Tyne, "Jipsey of Benton 4th" (26,125).
2nd. No. 164. Clement Stephenson, Sandyford Villa, Newcastle-on-Tyne, "Jipsey of Benton 3rd" (26,124).
3rd. No. 163. George A. Ross, Rhynie, Fearn, "Gazelle of Rhynie" (25,992).
4th. No. 162. James M'Kelvie, Hatton House, Kirknewton, Mid-Lothian, "Erica Essence" (25,171).
V. No. 160. W. S. Ferguson, Kinochtry, Coupar-Angus, "Pet Mina" (25,362).
H. No. 159. W. S. Ferguson, Kinochtry, Coupar-Angus, "Juniper Jam" (25,359).

CLASS 12. HEIFER, calved on or after 1st December 1897.—
Premiums, £10, £5, £3, and £2.

1st. No. 179. The Earl of Strathmore, Glamis Castle, Glamis, "Aquilegia."
2nd. No. 173. The Earl of Rosebery, K.G., Dalmeny Park, Edinburgh, "Abbess 3rd of Kippendavie" (27,609).
3rd. No. 166. George Bruce, Tochineal, Cullen, "Blossom of Tochineal."
4th. No. 177. Clement Stephenson, Sandyford Villa, Newcastle-on-Tyne, "Pride 13th of Kippendavie" (27,613).
V. No. 174. Thomas Smith, Powrie, Dundee, "Witch of Endor 36th" (27,544).
H. No. 169. Sir George Macpherson Grant, Bart., The Castle, Ballindalloch, "Ellipsis."
C. No. 168. Sir T. D. Gibson-Carmichael of Castle Craig, Bart., M.P., Dolphinton, "Sherbet" (26,875).
C. No. 175. Thomas Smith, Powrie, Dundee, "Prunella of Powrie 2nd" (27,540).
C. No. 180. The Earl of Strathmore, Glamis Castle, Glamis, "Eurydice."

GALLOWAY.

PRINCE OF WALES GOLD MEDAL for best Galloway.

No. 203. Sir Robert Jardine of Castlemilk, Bart., Lockerbie, "Nancy Lee 2nd of Castlemilk" (14,678).

Best Bull in Classes 13, 14, *and* 15—£10, 10s., given by the Galloway Cattle Society.

No. 185. Sir Robert Jardine of Castlemilk, Bart., Lockerbie, "Druid of Castlemilk" (6159).

Breeder of best Bull of any age in Classes 13, 14, *and* 15—Silver Medal.

No. 185. Sir Robert Jardine of Castlemilk, Bart., Lockerbie.

CLASS 13. BULL, calved before 1897.—Premiums, £15, £10, £5, and £3.

1st. No. 185. Sir Robert Jardine of Castlemilk, Bart., Lockerbie, "Druid of Castlemilk" (6159).
2nd. No. 184. Chris. Graham, Harelawhill, Canonbie, "Minotaur" (6620).
3rd. No. 186. Wm. Parkin-Moore, Whitehall, Mealsgate, Cumberland, "Nonpareil of Castlemilk" (6163).

CLASS 14. BULL, calved in 1897.—Premiums, £15, £10, £5, and £3.

1st. No. 189. John Cunningham, Durham Hill, Dalbeattie, "Black Prince of Durham Hill" (6846).
2nd. No. 191. Robert Jefferson, Rothersyke, Egremont, Cumberland, "Jubilee Gift" (6856).
3rd. No. 190. Thomas Graham, Beaumont, Dumfries, "Master Stanley 2nd" (6817).

CLASS 15. BULL, calved in 1898.—Premiums, £12, £8, £4, and £2.

1st. No. 197. Wm. Parkin-Moore, Whitehall, Mealsgate, Cumberland, "MacDouglas of Whitehall" (7070).
2nd. No. 194. John Common, Crossdykes, Lockerbie, "Grace Royal" (7123).
3rd. No. 195. Chris. Graham, Skipmyre, Lochmaben, "Greater Scott" (7119).
4th. No. 193. Thomas Biggar & Sons, Chapelton, Dalbeattie, "Charlie Boy" (7075).

Best Female in Classes 16, 17, *and* 18—£10, 10s., given by the Galloway Cattle Society.

No. 203. Sir Robert Jardine of Castlemilk, Bart., Lockerbie, "Nancy Lee 2nd of Castlemilk" (14,678).

CLASS 16. COW, of any age.—Premiums, £12, £8, £4, and £2.

1st. No. 203. Sir Robert Jardine of Castlemilk, Bart., Lockerbie, "Nancy Lee 2nd of Castlemilk" (14,678).
2nd. No. 199. Thomas Biggar & Sons, Chapelton, Dalbeattie, "Braw Lady of Harelawhill" (13,030).
3rd. No. 200. John Cunningham, Durham Hill, Dalbeattie, "Louisa of Durham Hill" (14,355).
4th. No. 201. John Cunningham, Durham Hill, Dalbeattie, "Louisa 2nd of Durham Hill" (14,925).
H. No. 202. Sir Robert Jardine of Castlemilk, Bart., Lockerbie, "Scottish Queen 2nd of Castlemilk" (14,284).
C. No. 204. Robert Jefferson, Rothersyke, Egremont, Cumberland, "Gaiety of Whitehall" (14,305).

CLASS 17. HEIFER, calved in 1897.—Premiums, £10, £5, £3, and £2.

1st. No. 206. John Cunningham, Durham Hill, Dalbeattie, "Maggie Lauder 2nd ot Durhamhill" (15,140).
2nd. No. 209. Sir Robert Jardine of Castlemilk, Bart., Lockerbie, "Cricket of Castlemilk" (15,022).
3rd. No. 210. Sir Robert Jardine of Castlemilk, Bart., Lockerbie, "Nancy Lee 3rd of Castlemilk" (15,019).
4th. No. 207. Colonel Dudgeon of Cargen, Dumfries, "Beauty 2nd."

CLASS 18. HEIFER, calved in 1898.—Premiums, £10, £5, £3, and £2.

1st. No. 216. Robert T. Scott, Drumhumphry, Corsock, Dalbeattie, "Bell 13th of Drumhumphry" (15,540).
2nd. No. 212. Colonel Dudgeon of Cargen, Dumfries, "Hannah XXIV."
3rd. No. 220. Sir John Swinburne, Bart., Capheaton, Newcastle-upon-Tyne, "Scottish Queen 3rd" (15,750).
4th. No. 221. James Wilson, Tundergarth Mains, Lockerbie, "Tidy 2nd" (15,776).
V. No. 218. H. G. Murray Stewart of Cally, Gatehouse, "Maggie 10th of Cally" (15,662).
H. No. 214. Sir Robert Jardine of Castlemilk, Bart., Lockerbie, "Grizel of Castlemilk" (15,408).
C. No. 215. William Parkin-Moore, Whitehall, Mealsgate, Cumberland, "Pearl 2nd of Whitehall" (15,412).

HIGHLAND.

PRINCE OF WALES GOLD MEDAL for best Highland Animal.

No. 222. The Duke of Atholl, K.T., Blair Castle, Blair Atholl, "Calum Riabhach II. of Atholl" (1325).

Breeder of best Bull of any age in Classes 19, 20, *and* 21—Silver Medal.

No. 222. The Duke of Atholl, K.T., Blair Castle, Blair Atholl.

CLASS 19. BULL, calved before 1897.—Premiums, £15, £10, £5, and £3.

1st. No. 222. The Duke of Atholl, K.T., Blair Castle, Blair Atholl, "Calum Riabhach II. of Atholl" (1325).
2nd. No. 228. Thomas Valentine Smith, Ardtornish, Morvern, R.S.O., "Victor XVI" (1427).
3rd. No. 229. Representatives of the late John Stewart of Ensay, Obbe, "Rhu-na-Scarbh" (1410).
4th. No. 223. Lord Malcolm of Poltalloch, Lochgilphead, "Balach-a-Ghlinne-So" (1191).
V. No. 225. Alexander Macdonald of Balranald, Edenwood House, Springfield, Fife, "Gille Molach" (1242).
H. No. 227. Sir A. J. Campbell Orde of Kilmory, Bart., Lochgilphead, "Dochfour" (1222).
C. No. 224. F. Morgan, Glengorm, Tobermory, Mull, "Graidheain."

CLASS 20. BULL, calved in 1897.—Premiums, £15, £10, £5, and £3.

1st. No. 233. Donald Graham, Airthrey Castle, Bridge of Allan, "Muc-a-Mhuillich."
2nd. No. 234. A. D. & D. M'Gregor, Kinlochmoidart, Fort William, "Iain of Ardanaiseig" (1384).
3rd. No. 237. The Earl of Southesk, K.T., Kinnaird Castle, Brechin, "Darnley" (1340).
4th. No. 231. John Stirling Ainsworth, Ardanaiseig, Kilchrenan, "Tailceanach of Ardanaiseig" (1423).
V. No. 238. John Stewart, Bochastle, Callander, "Gille Ruadh."
H. No. 235. B. G. Walker Morison, Falfield, Cupar-Fife, "Iarla Falfield."
C. No. 232. Marquis of Breadalbane, K.G., Taymouth Castle, Aberfeldy, "Norman."

CLASS 21. BULL, calved in 1898.—Premiums, £12, £8, £4, and £2.

1st. No. 241. The Duke of Atholl, K.T., Blair Castle, Blair Atholl, "Calum Buidhe of Atholl."
2nd. No. 246. The Earl of Southesk, K.T., Kinnaird Castle, Brechin, "Percy" (1407).
3rd. No. 243. John R. M. Macdonald of Largie, Largie Castle, Tayinloan, "Raoghal Riabhach 'na Laragaidh."
4th. No 245. Thomas Valentine Smith, Ardtornish, Morvern, R.S.O., "Valentine XVI."
V. No. 240. John Stirling Ainsworth, Ardanaiseig, Kilchrenan, "An' Sergeau II."
H. No. 242. W. Dawson, Tormore, Advie, Strathspey, "The Duke."
C. No. 244. Thomas Valentine Smith, Ardtornish, Morvern, R.S.O., "Valentine XV."

CLASS 22. COW, of any age.—Premiums, £12, £8, £4, and £2.

1st. No. 262. Thomas Valentine Smith of Ardtornish, Morvern, R.S.O., "Sgiathach XVI." (4223).
2nd. No. 251. George Bullough, Isle of Rum, Oban, "Rhouma" (3928).
3rd. No. 261. Thomas Valentine Smith of Ardtornish, Morvern, R.S.O., "Sgiathach XV." (3809).
4th. No. 248. The Duke of Atholl, K.T., Blair Castle, Blair Atholl, "Donnag Riabhach III." (2552).
V. No. 260. Thomas Valentine Smith of Ardtornish, Morvern, R.S.O., "Mairi Buidhe IV." (3801).
H. No. 249. John S. Blair, Melfort, Kilmelford, "Maggie of Melfort" (3493).
C. No. 257. Lord Malcolm of Poltalloch, Lochgilphead, "A' Bhanarach."

CLASS 23. HEIFER, calved in 1896.—Premiums, £10, £5, £3, and £2.

1st. No. 265. The Duke of Atholl, K.T., Blair Castle, Blair Atholl, "Mairi Bhuidhe of Atholl."
2nd. No. 266. The Duke of Atholl, K.T., Blair Castle, Blair Atholl, "Beauty IV. of Atholl."
3rd. No. 276. The Earl of Southesk, K.T., Kinnaird Castle, Brechin, "Lady Clare"
4th. No. 270. William Macgillivray, Garbole, Tomatin.
V. No. 273. Thomas Valentine Smith, Ardtornish, Morvern, R.S.O., "Sgiathach XXI." (4228).
H. No. 275. The Earl of Southesk, K.T., Kinnaird Castle, Brechin, "Cassandra" (3813).
C. No. 264. John Stirling Ainsworth, Ardanaiseig, Kilchrenan, "Bheadarrach III. of Ardanaiseig."

CLASS 24. HEIFER, calved in 1897.—Premiums, £10, £5, £3, and £2.

1st. No. 290. Thomas Valentine Smith, Ardtornish, Morvern, R.S.O., "Sgiathach XXIV."
2nd. No. 291. Thomas Valentine Smith, Ardtornish, Morvern, R.S.O., "Cruinneag VI. of Ardtornish."
3rd. No. 293. The Earl of Southesk, K.T., Kinnaird Castle, Brechin, "Lady Doris" (4237).
4th. No. 295. John Stewart, Bochastle, Callander, "Proiseag Riabhach III."
V. No. 279. Marquis of Breadalbane, K.G., Taymouth Castle, Aberfeldy, "Myzie 5th."
H. No. 294. John Stewart, Bochastle, Callander, "Annag Riabhach."
C. No. 287. William Dalziel Mackenzie of Farr, Farr House, Daviot, Inverness, "Bhan Ruadh of Farr" (4106).

CLASS 25. BULLOCKS, over two and not exceeding three years old, both sire and dam to be entered in the Highland Herd-Book.—Premiums, £10, 10s., and £5, 5s. Given by Sir William Ogilvy-Dalgleish, Bart.

1st. No. 297. Sir William Ogilvy-Dalgleish of Errol, Bart., Perthshire.
2nd. No. 296. Sir William Ogilvy-Dalgleish of Errol, Bart., Perthshire.

AYRSHIRE.

PRINCE OF WALES GOLD MEDAL for best Ayrshire.

No. 319. R. & J. M'Alister, Mid Ascog, Rothesay, "Sweet Briar."

Breeder of best Bull of any age in Classes 26, 27, *and* 28—Silver Medal.

No. 299. James Howie, Hillhouse, Kilmarnock.

CLASS 26. BULL, calved before 1897.—Premiums, £12, £8, and £4.

1st. No. 299. James Howie, Hillhouse, Kilmarnock, "Kooh-i-noor" (3678).
2nd. No. 300. Robert Osborne, Wynholm, Lockerbie, "Gigantic Stunner" (3872).
3rd. No. 298. George Gilmour, Saturland Farm, Barrhead, "Rare Style" (3905).
H. No. 301. Robert Wardrop, Garlaff, Cumnock, "Darnley" (3599).

CLASS 27. BULL, calved in 1897.—Premiums, £12, £8, and £4.

1st. No. 304. Andrew Mitchell, Barcheskie, Kirkcudbright, "Marquis."
2nd. No. 307. Robert Young, Knockrioch, Campbeltown, "Bend 'Or."
3rd. No. 305. Robert Montgomerie, Lessnessock, Ochiltree, "Blucher."
H. No. 303. William Miller, Powillimount, Dumfries, "New Year's Gift of Powillimount" (4072).

CLASS 28. BULL, calved in 1898.—Premiums, £8, £5, and £3.

1st. No. 310. James Howie, Hillhouse, Kilmarnock, "Strongbow."
2nd. No. 308. Thomas Barr, Monkland, Kilmarnock, "General."
3rd. No. 311. Robert Osborne, Wynholm, Lockerbie, "Still Another" (4023).
H. No. 312. Robert Osborne, Wynholm, Lockerbie, "Expectation" (4024).

CLASS 29. COW (in Milk), calved before 1896.—Premiums, £10, £7, and £3.

1st. No. 319. R. & J. M'Alister, Mid Ascog, Rothesay, "Sweet Briar."
2nd. No. 320. James Neill, Barleith, Hurlford, Kilmarnock, "Hover-a-Blink 13th" (9831).
3rd. No. 318. R. & J. M'Alister, Mid Ascog, Rothesay, "Maid of Bute" (12,282).
V. No. 316. James Dunlop, Gree Farm, Fenwick, "Cherry 2nd."
H. No. 314. Alexander Cross of Knockdon, Maybole, "Sloth 4th" (9807).
C. No. 317. R. & J. Hunter, Foulton, Monkton, "Miss Sybil" (10,116).

CLASS 30. COW (in Milk), calved in 1896.—Premiums, £10, £7, and £3.

1st. No. 329. R. & J. M'Alister, Mid Ascog, Rothesay, "Lady Ascog" (12,283).
2nd. No. 330. William Reid, Titwood, Newton, Mearns, "Wattie of Titwood" (12,208).
3rd. No. 326. Alexander Cross of Knockdon, Maybole, "Miss Orr."
C. No. 332. Robert Wilson, Manswraes, Bridge of Weir, "Mayflower" (11,688).

CLASS 31. COW of any age, in Calf, or HEIFER calved in 1896, in Calf and due to calve within three months of the first day of the Show.—Premiums, £10, £7, and £3.

1st. No. 337. Robert Wilson, Manswraes, Bridge of Weir, Cow, "Heiress" (11,277).
2nd. No. 335. James Neill, Barleith, Hurlford, Kilmarnock, Cow, "Topsy of Barleith."
3rd. No. 333. R. & J. M'Alister, Mid Ascog, Rothesay, Cow, "Whitelegs."
H. No. 325. Alexander Cross, of Knockdon, Maybole, Cow, "Agnes 3rd" (10,520).
C. No. 334. R. & J. M'Alister, Mid Ascog, Rothesay, Cow, "Miranda."

CLASS 32. HEIFER, calved in 1897.—Premiums, £10, £5, and £3.

1st. No. 339. Andrew Mitchell, Barcheskie, Kirkcudbright, "Lily."
2nd. No. 343. Robert Wardrop, Garlaff, Cumnock, "Sonsy."
3rd. No. 341. Robert Montgomerie, Lessnessock, Ochiltree, "Viola."
V. No. 340. Robert Montgomerie, Lessnessock, Ochiltree, "Pansy."
H. No. 342. Robert Osborne, Wynholm, Lockerbie, "Nancy."
C. No. 338. Andrew Mitchell, Barcheskie, Kirkcudbright, "White Rose 3rd" (11,665).

CLASS 33. HEIFER, calved in 1898.—Premiums, £8, £5, and £3.

1st. No. 347. Andrew Mitchell, Barcheskie, Kirkcudbright, "Mary."
2nd. No. 345. G. J. Ferguson Buchanan of Auchentorlie, Bowling, "Snowdrop of Auchentorlie."
3rd. No. 352. Robert Wardrop, Garlaff, Cumnock, "Lady Primrose."
V. No. 344. Thomas Barr, Monkland, Kilmarnock, "Dorothy."
H. No. 350. Sir Mark J. M'Taggart Stewart of Southwick, Bart., M.P., Dumfries, "Betty" (12,536).
C. No. 346. James Howie, Hillhouse, Kilmarnock, "Sonsy Queen."

JERSEY.

PRINCE OF WALES GOLD MEDAL for best Jersey.

No. 370. Earl of Hopetoun, Hopetoun House, South Queensferry, "Fiona Beresford."

CLASS 34. BULL, any age.—Premiums, £10, £5, and £3.

1st. No. 354. Colonel Dudgeon of Cargen, Dumfries, "Hortense Lad."
2nd. No. 357. Mrs Cyril Greenall, Walton Hall, Warrington, "Golden Monarch."
3rd. No. 358. Mrs Cyril Greenall, Walton Hall, Warrington, "Lord Rioto."
V. No. 361. Earl of Hopetoun, Hopetoun House, South Queensferry, "Beresford Hope."
H. No. 356. T. R. B. Elliot, Clifton Park, Kelso, "Grey Lad."
C. No. 359. James G. Baird Hay of Belton, Dunbar, "Rugosa."
C. No. 363. The Hon. Mrs C. Howard, Dutchlands, Great Missenden, Bucks, "Hypolyte."

CLASS 35. COW (in Milk), calved before 1897.—Premiums, £10, £5, and £3.

1st. No. 370. Earl of Hopetoun, Hopetoun House, South Queensferry, "Fiona Beresford."
2nd. No. 368. Mrs Cyril Greenall, Walton Hall, Warrington, "Longueville Brownie 4th."
3rd. No. 367. Mrs Cyril Greenall, Walton Hall, Warrington, "Péronne" (6386).
V. No. 369. Mrs Cyril Greenall, Walton Hall, Warrington, "Regalia" (8430).
H. No. 372. Hon. Mrs C. Howard, Dutchlands, Great Missenden, Bucks, "Habenaria."
C. No. 366. T. R. B. Elliot, Clifton Park, Kelso, "Lady Say."

CLASS 36. COW (in Milk), or HEIFER in Calf, calved in 1897.—Premiums, £10, £5, and £3.

1st. No. 376. Mrs Cyril Greenall, Walton Hall, Warrington, "Countess Mabel."
2nd. No. 378. Earl of Hopetoun, Hopetoun House, South Queensferry, "Eugenie Beresford."
3rd. No. 375. T. R. B. Elliot, Clifton Park, Kelso, "Distinction's Belle."
V. No. 374. T. R. B. Elliot, Clifton Park, Kelso, "Princess Mona."
H. No. 373. Colonel Dudgeon of Cargen, Dumfries, "Jubilee."

CLASS 37. HEIFER, calved in 1898.—Premiums, £8, £4, and £2.

1st. No. 382. Mrs Cyril E. Greenall, Walton Hall, Warrington, "Sweet Eyes 2nd."
2nd. No. 383. Mrs Cyril E. Greenall, Walton Hall, Warrington, "White Mona 2nd."
3rd. No. 381. T. R. B. Elliot, Clifton Park, Kelso, "Labinia 3rd."
V. No. 384. Earl of Hopetoun, Hopetoun House, South Queensferry, "Pansy."
H. No. 379. Colonel Dudgeon of Cargen, Dumfries, "Nelly Bell."
C. No. 380. T. R. B. Elliot, Clifton Park, Kelso, "Conquest."

EXTRA CATTLE—CROSS.

The following was Very Highly Commended and a Medium Silver Medal awarded.

V. No. 386. Sir John Gilmour of Lundin and Montrave, Bart., Leven, Cross Bullock.

HORSES

FOR AGRICULTURAL PURPOSES.

DRAUGHT STALLIONS.

PRINCE OF WALES GOLD MEDAL for best Clydesdale Stallion.

No. 393. John Pollock, Paper Mill, Langside, "Hiawatha" (10,067).

Breeder of best Male Animal of any age in Classes 38 *to* 41—Silver Medal.

No. 393. William Hunter, Garthland Mains, Stranraer.

CLASS 38. STALLION, foaled before 1896.—Premiums, £20, £15, £10, and £4.

1st. No. 393. John Pollock, Paper Mill, Langside, "Hiawatha" (10,067).
2nd. No. 391. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "Gold Found" (10,200).
3rd. No. 392. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "Mackinley" (10,228).
4th. No. 395. Alexander Scott, Berryyards, Greenock, "Prince Murat" (10,027).
V. No. 387. W. & G. Cairns, Walltower, Penicuik, "Premier Prince" (10,248).

CLASS 39. ENTIRE COLT, foaled in 1896.—Premiums, £20, £15, £10, and £4.

1st. No. 401. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "Watchword" (10,477).
2nd. No. 412. Herbert Webster, Morton House, Fence Houses, "Lord Fauntleroy" (10,370).

3rd. No. 402. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "Black Rod" (10,509).
4th. No. 404. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "Fickle Prince" (10,344).
V. No. 397. R. & J. M'Alister, Mid Ascog, Rothesay, "Record Reign" (10,424).
H. No. 403. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "St Christopher" (10,449).
C. No. 400. A. B. Matthews, British Linen Bank, Newton-Stewart, "Top-knot 2nd" (10,472).
C. No. 405. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "Agitator" (10,488).

CLASS 40. ENTIRE COLT, foaled in 1897.—Premiums, £20, £12, £8, and £4.

1st. No. 420. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "Drumflower" (10,537).
2nd. No. 434. Herbert Webster, Morton House, Fence Houses, "Baron Kitchener" (10,499).
3rd. No. 419. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "Coroner" (10,532).
4th. No. 413. Richard Dunn, Udston Cottage Farm, Hamilton, "Rozelle" (10,638).
V. No. 422. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "Climax" (10,529).
H. No. 424. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "Bravado" (10,519).
C. No. 418. A. B. Matthews, British Linen Bank, Newton-Stewart, "Ideal" (10,573).
C. No. 421. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright.

CLASS 41. ENTIRE COLT, foaled in 1898.—Premiums, £15, £10, £6, and £4.

1st. No. 442. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "Blacon Baron."
2nd. No. 446. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright.
3rd. No. 440. A. B. Matthews, British Linen Bank, Newton-Stewart.
4th. No. 443. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright.
V. No. 436. William Dunlop, Dunure Mains, Ayr, "Sylvander."
H. No. 453. William Taylor, Park Mains, Renfrew.
C. No. 437. Sir John Gilmour of Montrave, Bart., Leven, "Montrave Ronald."
C. No. 444. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright.

CLASS 42. DERBY of 1899 for YEARLING COLTS.—
Premiums, £7, £4, £3, £2, and £1.

1st. No. 440. A. B. Matthews, British Linen Bank, Newton-Stewart.
2nd. No. 443. David Young, Irene Park, Portobello.
3rd. No. 436. William Dunlop, Dunure Mains, Ayr, "Sylvander."
4th. No. 437. Sir John Gilmour of Montrave, Bart., Leven, "Montrave Ronald."
5th. No. 439. Matthew Marshall, Bridgebank, Stranraer.

DRAUGHT GELDINGS.

PRINCE OF WALES GOLD MEDAL for best Draught Gelding.

No. 458. William Clark, Netherlea, Cathcart, "Cock of the North."

CLASS 43. DRAUGHT GELDING, foaled before 1896.—
Premiums, £10, £5, and £3.

1st. No. 458. William Clark, Netherlea, Cathcart, "Cock of the North."
2nd. No. 463. David Hastie, Stonefield Farm, Blantyre, "The Governor."
3rd. No. 460. James Eadie, Barron Hall, Derby, "Bardon Extraordinary."
H. No. 459. James Eadie, Barron Hall, Derby, "Barron Farmer."
C. No. 464. R. Sinclair Scott, Flatt Farm, Largs, "Prince of Wales."

CLASS 44. DRAUGHT GELDING, foaled in 1896.—Premiums, £6, £4, and £3.

1st. No. 468. Alexander Guild, Greenhead, Pencaitland, "Bruce."
2nd. No. 470. David Hastie, Stonefield Farm, Blantyre, "Johnie."
3rd. No. 474. William Tod, Pardovan, Philipstoun.
H. No. 471. John Reay, East Brunton, Newcastle-on-Tyne, "Rizzio."
C. No. 466. James Eadie, Barron Hall, Derby, "Barron Attractive."

CLASS 45. DRAUGHT GELDING, foaled in 1897.—Premiums, £6, £4, and £3.

1st. No. 477. Wm. Clark, Netherlea, Cathcart, "Perfection."
2nd. No. 476. Wm. Clark, Netherlea, Cathcart, "Surprise."
3rd. No. 483. David Hastie, Stonefield Farm, Blantyre, "Canoby."
V. No. 482. Alexander Guild, Greenhead, Pencaitland, "Major."
H. No. 484. Matthew Mather, Silverknowes, Davidson's Mains.

DRAUGHT MARES AND FILLIES.

PRINCE OF WALES GOLD MEDAL for best Clydesdale Mare or Filly.

No. 513. Herbert Webster, Morton House, Fence Houses, "Lady Victoria."

Best Mare or Filly registered in the Clydesdale Stud-Book—Cawdor Challenge Cup, value 50 guineas, given by the Clydesdale Horse Society.

No. 513. Herbert Webster, Morton House, Fence Houses, "Lady Victoria."

Breeder of Best Clydesdale Brood Mare—The Robert Murdoch Prize, value £10.

No. 486. Sir John Gilmour of Montrave, Bart., Leven.

CLASS 46. MARE, of any age, with Foal at foot.—Premiums, £20, £12, £7, and £4.

1st. No. 486. Sir John Gilmour of Montrave, Bart., Leven, "Montrave Rowena."
2nd. No. 490. William M'Keich, Woodend, Bucklyvie, by Stirling, "Lady Raffan."
3rd. No. 489. The Marquis of Londonderry, K.G., Seaham Hall, Seaham Harbour, "Essence."
4th. No. 487. Alexander Guild, Greenhead, Pencaitland, "Lady Margaret."
V. No. 492. D. Riddell, Blackhall, Paisley, "Lightsome Lass."

CLASS 47. YELD MARE, foaled before 1896.—Premiums, £12, £9, £6, and £4.

1st. No. 496. W. H. Lumsden of Balmedie, Aberdeen, "Balmedie Queen Mab" (13,513).
2nd. No. 497. James F. Murdoch, East Hallside, Newton, "Lady M'Clelland."
3rd. No. 503. Herbert Webster, Morton House, Fence Houses, "Lady Lockhart" (13,318).
4th. No. 502. R. Sinclair Scott, Flatt Farm, Largs, Ayrshire, "Scottish Peeress."
V. No. 495. Sir John Gilmour of Montrave, Bart., Leven, "Montrave Rosamond."
H. No. 499. Lord Polwarth, Mertoun, St Boswells, "Border Meg."
C. No. 504. Herbert Webster, Morton House, Fence Houses, "Lady Pride."

CLASS 48. YELD MARE or FILLY, foaled in 1896.—Premiums, £12, £9, £6, and £4.

1st. No. 513. Herbert Webster, Morton House, Fence Houses, "Lady Victoria."
2nd. No. 511. Thomas Smith, Blacon Point, Chester, "Empress."
3rd. No. 509. William Park, Brunstane, Portobello, "Sunray."
4th. No. 506. St Clair Cunningham, Hedderwick Hill, Dunbar, "Minnie of Walkinshaw."
V. No. 508. A. B. Matthews, British Linen Bank, Newton Stewart, "The Diamond Queen."
H. No. 505. Earl Cawdor, Cawdor Castle, Nairn, "Nellie Grey."
C. No. 507. Frank Elliott, Middlestots, Duns, "Lady Sinclair."

CLASS 49. FILLY, foaled in 1897.—Premiums, £12, £9, £6, and £4.

1st. No. 528. Thomas Smith, Blacon Point, Chester, "Jeannie Deans."
2nd. No. 521. Alexander Guild, Greenhead, Pencaitland, "Maid of Athens."
3rd. No. 518. Richard Dunn, Udston Cottage Farm, Hamilton, "Braw Lass."
4th. No. 517. St Clair Cunningham, Hedderwick Hill, Dunbar, "Maggie Holmes."
V. No. 530. John Weir, Townhead Farm, Lanark, "Baron's Queen."
H. No. 520. Sir John Gilmour of Montrave, Bart., Leven, "Montrave Geisha."
C. No. 525. Ferrier Pace, Ormiston Mains, Ormiston, "Lady Rosemount."

CLASS 50. FILLY, foaled in 1898.—Premiums, £12, £9, £6, and £4.

1st. No. 539. Alexander Guild, Greenhead, Pencaitland, "Topsy Pride."
2nd. No. 551. R. Sinclair Scott, Flatt Farm, Largs, Ayrshire, "Scottish Baroness."
3rd. No. 543. Henry B. Marshall, Rachan, Broughton, Peeblesshire.
4th. No. 545. James F. Murdoch, East Hallside, Newton, "Lady Picken."
V. No. 531. George Alston, Loudoun Hill, Darvel, "Messilina."
H. No. 552. Thomas Smith, Blacon Point, Chester, "Cedric Princess."
H. No. 547. William Park, Brunstane, Portobello, "Lady Helen."
C. No. 540. John Lamont, Toward Farm, Toward, "Princess Shapely."
C. No. 548. Leonard Pilkington, Cavens, Dumfries, "Cherry Ripe."

CLASS 51. DERBY of 1899 for YEARLING FILLIES.—
Premiums, £8, £6, £3, £2, and £1.

1st. No. 539. David Young, Irene Park, Portobello, "Topsy Pride."
2nd. No. 531. George Alston, Loudoun Hill, Darvel, "Messilina."
3rd. No. 547. William Park, Brunstane, Portobello, "Lady Helen."
4th. No. 552. Thomas Smith, Blacon Point, Chester, "Cedric Princess."
5th. No. 535. J. Douglas Fletcher of Rosehaugh, Avoch, N.B., "Duchess of Rosehaugh."
V. No. 541. The Marquis of Londonderry, K.G., Seaham Hall, Seaham Harbour.
H. No. 536. J. Douglas Fletcher of Rosehaugh, Avoch, N.B., "Lady Evie."
C. No. 534. St Clair Cunningham, Hedderwick Hill, Dunbar, "Mary Stewart."

HUNTERS.

PRINCE OF WALES GOLD MEDAL for best Hunter, Colt or Gelding.

No. 671. T. D. John, Chaldeans Stud Farm, St Fagans, near Cardiff, Gelding, "Gendarme."

PRINCE OF WALES GOLD MEDAL for best Hunter, Mare or Filly.

No. 721. T. D. John, Chaldean Stud Farm, St Fagans, Mare, "The Witch" (1653).

CLASS 52. COLT, GELDING, or FILLY, foaled in 1898, the produce of thoroughbred Stallions, out of Mares of any breed.—Five Prizes—£10, £7, £5, £2, and £1, given by Sir John Gilmour of Montrave, Bart.

1st. No. 559. Sir R. Waldie Griffith of Hendersyde Park, Bart., Kelso, Gelding.
2nd. No. 571. J. Harling Turner, Cessnock, Galston, Ayrshire, Gelding, "Crossburn."
3rd. No. 567. John Sanderson, Anick Grange, Hexham, Gelding, "Hexham."
4th. No. 568. John Sanderson, Anick Grange, Hexham, Filly, "Maude."
5th. No. 561. Captain G. D. Clayhills Henderson of Invergowrie, R.N., Dundee, Filly, "Spinning Girl."

Best Hunter Filly in Classes 53 *and* 54—Gold Medal, value £10, 10s., given by Hunters' Improvement Society.

No. 584. Lord Polwarth, Mertoun House, St Boswells, Filly, "Fleetfast."

CLASS 53. FILLY, MARE, or GELDING, for field, foaled in 1897, *in hand*.—
Premiums, £12, £8, and £4.

1st. No. 581. David Mitchell, Millfield, Polmont, Gelding, "Julius."
2nd. No. 585. John Sanderson, Anick Grange, Hexham, Gelding, "Jubilee Monarch."

3rd. No. 584. Lord Polwarth, Mertoun House, St Boswells, Filly, "Fleetfast."
V. No. 573. William Dent, Fighting Cocks, Darlington, Filly, "Topsy."
V. No. 586. J. Robson Scott, Newton, Jedburgh, Gelding.
H. No. 578. R. W. B. Jardine, yr. of Castlemilk, Lockerbie, Gelding.

CLASS 54. YELD MARE, FILLY, or GELDING, for field, foaled in 1896, *in hand.*—Premiums, £20, £10, and £5.

1st. No. 597. T. D. John, Chaldeans Stud Farm, St Fagans, near Cardiff, Gelding, "Huntsman."
2nd. No. 595. Joseph Hugill, Sockburn, Darlington, Gelding, "Sockburn."
3rd. No. 598. Mrs Johnstone of Halleaths, Broadholm, Lockerbie, Filly, "Liberty Belle."
V. No. 591. James Scott Black, Balgowan, Perth, Mare, "Mayflower" (1502).
V. No. 606. M. Tyndall, Skinburness, Silloth, Gelding, "Highmoor."
H. No. 601. Nathaniel Morton, Brookville, Ballymena, Co. Antrim, Mare, "Emerald."

Champion Prize of £50 *for the best Hunter in Classes* 55, 56, 57, 58, *and* 59, given by Mid-Lothian County Club.

No. 671. T. D. John, Chaldeans Stud Farm, St Fagans, near Cardiff, Gelding "Gendarme."

Special Prize of £20 *for the best Hunter in Classes* 55, 56, 57, 58, *and* 59, *irrespective of the weight it can carry, the winner of the* £50 *Champion Prize excluded,* given by Mr Fred. Usher, Norton Mains.

No. 619. J. H. Stokes, Nether House, Great Bowden, Market-Harborough, Gelding, "Ignition."

Prizes of £10 *and* £5 *for best and second-best Hunter in any of the Hunter Classes, the property of a tenant-farmer, and regularly hunted with any pack of foxhounds in Scotland in the season* 1898-99, given by Mr James Hope, East Barns.

1st. No. 659. W. A. G. Binnie, Birnie Knowes, Cockburnspath, Gelding, "Flamingo."
2nd. No. 676. James Moffat, Whitehaugh, Hawick, Gelding, "The Vole."

Prizes of £20 *and* £10 *for best and second-best Hunter in any of the Hunter Classes, the property of a tenant-farmer, and regularly hunted with any pack of foxhounds in the United Kingdom in the season* 1898-99.

1st. No. 685. J. H. Stokes, Great Bowden, Market-Harborough, Gelding, "Briton."
2nd. No. 641. Thos. Bradley, Uffington, Stamford, Gelding, "Sequent."

Prizes of £15 *and* £5 *for best and second-best Hunter of any age, in any of the Hunter Classes, regularly hunted by a lady with any pack of foxhounds in the United Kingdom in the season* 1898-99.

1st. No. 620. Thomas & Henry Ward, Pinchinthorpe, Great Ayton, R.S.O., Yorkshire, Gelding, "The Knight."
2nd. No. 701. T. D. John, Chaldeans Stud Farm, St Fagans, near Cardiff, Gelding, "Sportsman."

CLASS 55. MARE or GELDING, foaled in 1895, able to carry over 13 stone 7 lb., *in saddle.*—Premiums, £30, £20, £10, and £5.

1st. No. 619. J. H. Stokes, Nether House, Great Bowden, Market-Harborough, Gelding, "Ignition."
2nd. No. 609. Thomas Bradley, Uffington, Stamford, Gelding, "Sequel."
3rd. No. 610. Charles Edward Clark, North Ferreby, near Brough, East Yorks, Gelding, "Raby."
4th. No. 618. David Smallwood, Old Abbey Hotel, Whitby, Yorks, Gelding, "John Peel."
V. No. 614. Nathaniel Morton, Brookville, Ballymena, Ireland, Gelding, "Hunt Secretary."

CLASS 56. MARE or GELDING, foaled in 1895, able to carry from 12 stone to 13 stone 7 lb., *in saddle*.—Premiums, £30, £15, £8, and £4.

1st. No. 633. J. H. Stokes, Nether House, Great Bowden, Market-Harborough, Gelding, "Emissary."
2nd. No. 625. Nathaniel Morton, Brookville, Ballymena, Ireland, Gelding, "North Mayo."
3rd. No. 635. Thomas & Henry Ward, Pinchinthorpe, Great Ayton, R.S.O., Yorkshire, Mare, "Empress."
4th. No. 631. J. Robson Scott, Newton, Jedburgh, Gelding.
V. No. 622. R. W. Creswell-Ward, Neasham Hill, Darlington, Mare, "Ladybird."
H. No. 630. John Sanderson, Anick Grange, Hexham, Filly, "Primrose" (1569).

CLASS 57. MARE or GELDING, foaled before 1895, able to carry over 15 stone, *in saddle*.—Premiums, £50, £25, and £15.

1st. No. 651. John J. Moubray of Naemoor, Rumbling Bridge, Gelding, "Tatoo."
2nd. No. 641. Thomas Bradley, Uffington, Stamford, Gelding, "Sequent."
3rd. No. 653. J. H. Stokes, Nether House, Great Bowden, Market-Harborough, Gelding.
V. No. 648. Sir James Miller, Bart., Manderston, Duns, Gelding, "Neasden."
V. No. 649. Nathaniel Morton, Brookville, Ballymena, Ireland, Gelding, "Master of Hounds."

CLASS 58. MARE or GELDING, foaled before 1895, able to carry from 13 stone 7 lb. to 15 stone, *in saddle*.—Premiums, £50, £20, £10, and £5.

1st. No. 671. T. D. John, Chaldeans Stud Farm, St Fagans, near Cardiff, Gelding, "Gendarme."
2nd. No. 685. J. H. Stokes, Great Bowden, Market-Harborough, Gelding, "Briton."
3rd. No. 664. Alexander Cross, Ladybank, Renfrewshire, Gelding, "Jamieson."
4th. No. 683. A. H. Renton, Leighton-Buzzard, Gelding, "The Count."
V. No. 661. James Craig, Curriehill, Currie, Mare, "Victoria."
H. No. 663. W. Crichton, Charleston, Lanark, Gelding, "Athole."
C. No. 670. Samuel Isherwood, Shorefield, Dunscar, Bolton, Lancashire, Gelding, "Sterling."

CLASS 59. MARE or GELDING, foaled before 1895, able to carry from 12 stone to 13 stone 7 lb., *in saddle*.—Premiums, £40, £15, £8, and £4. £40 given by Joint Masters of Linlithgow and Stirlingshire Hunt.

1st. No. 707. A. H. Renton, Linslade, Leighton-Buzzard, Gelding, "King John."
2nd. No. 714. Fred Usher, Norton Mains, Ratho Station, Gelding, "Calder."
3rd. No. 701. T. D. John, Chaldeans Stud Farm, St Fagans, near Cardiff, Gelding, "Sportsman."
4th. No. 698. Edward Hoyle, Moorlands, Bacup, Gelding, "Bonaparte."
V. No. 705. Nathaniel Morton, Brookville, Ballymena, Ireland, Gelding, "Shelvoden."

CLASS 60. HUNTER, BROOD MARE, with Foal at foot, or to foal this season.—Premiums, £15, £8, and £4. Given by Captain Clayhills Henderson of Invergowrie, R.N.

1st. No. 721. T. D. John, Chaldeans Stud Farm, St Fagans, near Cardiff, "The Witch" (1653).
2nd. No. 719. Captain G. D. Clayhills Henderson of Invergowrie, R.N., Dundee, "Princess Charlotte."
3rd. No. 726. W. Williams & Son, New Veterinary College, Edinburgh, "Alice Benbolt."
V. No 717. W. & G. Cairns, Walltower, Penicuik, "Witchwood."
H. No. 725. John Sanderson, Anick Grange, Hexham, "Fairy Queen."

HACKNEYS.

(ALL TO BE SHOWN IN HAND.)

PRINCE OF WALES GOLD MEDAL for best Female Hackney.

No. 729. Harry Livesey, Rotherfield, Sussex, "Orange Blossom" (5957).

Best Mare or Filly in Hackney or Pony Classes—Gold Medal, value £10, given by the Hackney Horse Society.

No. 729. Harry Livesey, Rotherfield, Sussex, "Orange Blossom" (5957).

CLASS 61. BROOD MARE, 15 hands and upwards, with Foal at foot, or to foal this season to a registered sire. Registered in the Hackney Stud-Book.—Premiums, £15, £10, and £5.

1st. No. 729. Harry Livesey, Rotherfield, Sussex, "Orange Blossom" (5957).
2nd. No. 727. Charles E. Galbraith, Terregles, Dumfries, "Queen of the West" (11,422).
3rd. No. 728. Charles E. Galbraith, Terregles, Dumfries, "Vivandiere" (10,589).
H. No. 731. David Mitchell, Millfield, Polmont, "Sabina" (9496).
C. No. 732. Alex. Morton, Gowanbank, Darvel, "Audacia" (6367).

CLASS 62. BROOD MARE, under 15 hands, with Foal at foot, or to foal this season to a registered sire. Registered in the Hackney Stud-Book.—Premiums, £15, £10, and £5.

1st. No. 737. Nathaniel Morton, Brookville, Ballymena, Ireland, "Dear Nell" (5215).
2nd. No. 735. Robert C. Marshall, Burntshields, Kilbarchan, "Flora Crompton" (10,927).
C. No. 734. William Kay, Flowerfield, Loanhead, "Moss Rose."

CLASS 63. YELD MARE or FILLY, foaled in 1896. Registered in the Hackney Stud-Book.—Premiums, £14, £8, and £4.

1st. No. 739. Charles E. Galbraith, Terregles, Dumfries, "Rosadora" (11,437).
2nd. No. 741. John Thomas Ireland, Molescroft Grange, Beverley, Yorkshire, "Lady Connaught" (vol. xvii.)
3rd. No. 740. Alexander Gemmell, Chelston, Ayr, "Conceit" (10,785).
H. No. 743. Henry Liddell-Grainger, Ayton Castle, Ayton, N.B., "Princess Marsh" (11,404).
C. No. 744. Henry Liddell-Grainger, Ayton Castle, Ayton, N.B., "Dancing Girl" (10,816).

CLASS 64. FILLY, foaled in 1897. Registered in the Hackney Stud-Book.—Premiums, £12, £7, and £4.

1st. No. 749. Sir Walter Gilbey, Bart., Elsenham Hall, Essex, "Bright Dorothy" (11,660).
2nd. No. 746. Charles E. Galbraith, Terregles, Dumfries, "Atalanta" (11,620).
3rd. No. 753. David Mitchell, Millfield, Polmont, "Polonia" (11,216).
H. No. 747. Charles E. Galbraith, Terregles, Dumfries, "Maisie" (12,071).
C. No. 751. Henry Liddell-Grainger, Ayton Castle, Ayton, N.B., "Border Lass" (11,654).
C. No. 755. Edward Ostlere, Kirkcaldy, "Limefield Rose" (12,052).

CLASS 65. FILLY, foaled in 1898, eligible for entry in the Hackney Stud-Book.—Premiums, £12, £7, and £4.

1st. No. 763. David Mitchell, Millfield, Polmont, "Filberta."
2nd. No. 758. Charles E. Galbraith, Terregles, Dumfries, "Verity."
3rd. No. 760. Henry Liddell - Grainger, Ayton Castle, Ayton, N.B., "Belle Heather."
C. No. 761. Henry Liddell-Grainger, Ayton Castle, Ayton, N.B., "Miss Lightfoot."

PRINCE OF WALES GOLD MEDAL for best Male Hackney.

No. 766. Sir Walter Gilbey, Bart., Elsenham Hall, Essex, "Hedon Squire" (4306).

Best Stallion or Colt in Hackney or Pony Classes—Gold Medal, value £10, given by the Hackney Horse Society.

No. 766. Sir Walter Gilbey, Bart., Elsenham Hall, Essex, "Hedon Squire" (4306).

CLASS 66. STALLION, foaled in or before 1896, over 15 hands. Registered in the Hackney Stud-Book.—Premiums, £20, £10, and £5.

1st. No. 766. Sir Walter Gilbey, Bart., Elsenham Hall, Essex, "Hedon Squire" (4306).
2nd. No. 768. Harry Livesey, Rotherfield, Sussex, "M'Kinley" (6475).
3rd. No. 767. Thomas Hall, East Farm, Langton, Malton, "Langton Masher" (6799).
H. No. 770. Frederick Wrench, Killacoona, Ballybrack, Ireland, "King Clovis" (6794).
C. No. 769. Alexander Morton, Gowanbank, Darvel, "Duke of Denmark" (5986).

CLASS 67. STALLION, foaled in or before 1896, over 14 and not over 15 hands. Registered in the Hackney Stud-Book.—Premiums, £20, £10, and £5.

1st. No. 775. Dixon Nicholson, The Grange, Watton, Cranswick, S.O., Hull, Yorks, "Watton Gentleman 2nd" (6232).
2nd. No. 776. George R. Watson, Parkhead Cross, Glasgow, "Hedon Sensation" (6042).
3rd. No. 774. Nathaniel Morton, Brookville, Ballymena, Ireland, "Extra Stamp" (5999),
H. No. 773. J. A. Mather, Grovehill Stud Farm, Thornhill, Dumfriesshire, N.B., "Spitfire" (6907).
C. No. 772. The Marquis of Londonderry, K.G., Seaham Hall, Seaham Harbour, "Rostock" (6882).

CLASS 68. ENTIRE COLT, foaled in 1897. Registered in the Hackney Stud-Book. —Premiums, £15, £8, and £4.

1st. No. 778. Henry Liddell-Grainger, Ayton Castle, Ayton, N.B., "Nugget" (6852).
2nd. No. 783. George Wilson, Cedar House, Garton, Duffield, "Rodasor" (6877).
3rd. No. 777. Henry Liddell-Grainger, Ayton Castle, Ayton, N.B., "Laertes" (6798).
H. No. 782. Ralph Rimmer, M.R.C.V.S., 52 Stramongate, Kendal, "Cinquivalli" (6686).

CLASS 69. ENTIRE COLT, foaled in 1898, eligible for entry in Hackney Stud-Book.—Premiums, £12, £7, and £4.

1st. No. 784. J. Harriott Bell, Rossie, Forgandenny, "Rossie Matchless."
2nd. No. 785. Charles E. Galbraith, Terregles, Dumfries, "Manila."
3rd. No. 788. David Mitchell, Millfield, Polmont, "Adorus."

ROADSTERS.

PRINCE OF WALES GOLD MEDAL for best animal in the Classes for Roadsters (70, 71) *and for Horses in Harness* (81, 82).

No. 810. Arthur E. Evans, Bronwylfa, Wrexham, Mare, "Sonata" (10,516).

CLASS 70. ROADSTER, MARE or GELDING, foaled before 1896, 15 hands and upwards, *in saddle.*—Premiums, £10, £5, and £3.

1st. No. 797. Tom Mitchell, The Park, Eccleshill, Bradford, Gelding, "Sam Weller."
2nd. No. 796. Henry Liddell-Grainger, Ayton Castle, Ayton, N.B., Mare, "Gold Lace" (8945).

3rd. No. 795. James J. L. Irving, Park Gate, Blackburn, Lancashire, Gelding, "Featherby Squire."
V. No. 805. Robert Wilson, jun., Northfield, Dunlop, Gelding, "The Shah."
H. No. 801. Thomas Neill, Assloss House, Kilmarnock, Mare, "Choir Girl" (9816).

CLASS 71. ROADSTER, MARE or GELDING, foaled before 1896, 14.2 and under 15 hands, *in saddle.*—Premiums, £10, £5, and £3.

1st. No. 810. Arthur E Evans, Bronwylfa, Wrexham, Mare, "Sonata" (10,516).
2nd. No. 811. Charles E. Green, 7 Gordon Terrace, Edinburgh, Mare, "Dawn."
3rd. No. 819. W. G. Storey, Clarendon Hotel, Edinburgh, Gelding, "Lord Clarendon."
V. No. 816. Edward Ostlere, Kirkcaldy, Mare, "Brenda" (9667).
H. No. 813. James Henderson, Bridge Street, Sunderland, Mare, "Daisy Belle."

PONIES.

PRINCE OF WALES GOLD MEDAL for best Pony.

No. 829. Mrs Fred. Holmes, Staveley Grange, Shipley, Yorkshire, Mare, "Love Letter" (11,028).

CLASS 72. STALLION, 3 years old and upwards, over 12, not exceeding 14 hands, *in hand.*—Premiums, £5, £3, and £2.

1st. No. 824. David Mitchell, Millfield, Polmont, "Marson."
2nd. No. 823. J. H. Munro Mackenzie, Calgary, Isle of Mull, "Sarchedon."
V. No. 822. Robert Kirkwood, Camelon, Falkirk, "Plough Boy."

CLASS 73. YELD MARE, FILLY, or GELDING, 3 years old and upwards, over 13 and not over 14½ hands, *in saddle.*—Premiums, £5, £3, and £2.

1st. No. 829. Mrs Fred. Holmes, Staveley Grange, Shipley, Yorkshire, Mare, "Love Letter" (11,028).
2nd. No. 834. Alexander Morton, Gowanbank, Darvel, Mare, "Rebecca."
3rd. No. 831. The Marquis of Londonderry, K.G., Seaham Hall, Seaham Harbour, Gelding, "Gamester."
V. No. 827. Alexander Gemmell, Chelston, Ayr, Filly, "Galatea."
H. No. 828. James Hamilton, Aldersyde, Uddingston, Mare, "Monaco."
C. No. 830. J. Gordon Jameson, Ardwall, Gatehouse-of-Fleet, Gelding, "Watty Wudspurs."

CLASS 74. YELD MARE, FILLY, or GELDING, 3 years old and upwards, over 12 and not over 13 hands, *in saddle.*—Premiums, £5, £3, and £2.

1st. No. 838. Miss Marianne Anderson, Barskimming, Mauchline, Ayrshire, Gelding, "Lucifer."
2nd. No. 849. Robert Wilson, jun., Northfield, Dunlop, Mare, "The Autocrat."
3rd. No. 845. Walter M'Gee, Bridge Street Grain Mills, Paisley, Gelding.

CLASS 75. STALLION, 3 years old and upwards, 12 hands and under, *in hand.*—Premiums, £5, £3, and £2.

1st. No. 850. The Ladies E. & D. Hope, Great Hollenden Farm, Underriver, Sevenoaks, "Rocket."

CLASS 76. YELD MARE, FILLY, or GELDING, 3 years old and upwards, 12 hands and under, *in saddle.*—Premiums, £5, £3, and £2.

1st. No. 852. Thomas H. Bennett, Knowehead, Uddingston, Gelding, "Peter."
2nd. No. 857. Walter M'Gee, Bridge Street Grain Mills, Paisley, Mare.
3rd. No. 855. George Hogarth, Edrington Castle Farm, Berwick-on-Tweed, Mare, "Butterfly."
C. No. 856. Robert Kirkwood, Camelon, Falkirk, Mare, "Lady Mars."

SHETLAND PONIES.

(ALL TO BE SHOWN IN HAND.)

PRINCE OF WALES GOLD MEDAL for best Shetland Pony.

No. 863. The Marquis of Londonderry, Maryfield, Bressay, Shetland, "Gondolier."

CLASS 77. STALLION, not exceeding 10½ hands, foaled before 1896.—Premiums, £5, £3, and £2.

1st. No. 863. The Marquis of Londonderry, Maryfield, Bressay, Shetland, "Gondolier."
2nd. No. 867. Anderson Manson, Laxfirth, Lerwick, "Home Rule."
3rd. No. 862. Patrick Graham, Kittochside, Busby, "Daniel."
V. No. 860. William Chapman, Ballymenoch, Glen Fruin, Helensburgh, "Hector" (183).
H. No. 866. R. W. R. Mackenzie, Earlshall, Leuchars, "Bonaparte" (168).
C. No. 864. Archibald W. M'Donald, Invernevis, Fort William, "Naughty."

CLASS 78. MARE, not exceeding 10½ hands, with Foal at foot.—Premiums, £5, £3, and £2.

1st. No. 872. The Ladies E. & D. Hope, Great Hollenden Farm, Underriver, Sevenoaks, "Vementry 2nd" (1104).
2nd. No. 877. The Marquis of Londonderry, Maryfield, Bressay, Lerwick, "Highland Mary."
3rd. No. 876. The Marquis of Londonderry, Maryfield, Bressay, Shetland "Sweetie."
V. No. 873. Countess of Hopetoun, Hopetoun House, South Queensferry, "Monstrosity."
V. No. 874. Mrs Wentworth Hope Johnstone, Skeynes, Edenbridge, Kent, "Hildigunna" (668).

CLASS 79. YELD MARE, FILLY, or GELDING, not exceeding 10½ hands, foaled before 1897.—Premiums, £5, £3, and £2.

1st. No. 883. Mrs Wentworth Hope Johnstone, Skeynes, Edenbridge, Kent, Mare, "Skylark."
2nd. No. 884. Mrs Wentworth Hope Johnstone, Skeynes, Edenbridge, Kent, Mare, "Sapphire."
3rd. No. 885. The Marquis of Londonderry, Maryfield, Bressay, Shetland, Mare, "Fancy Fair."
V. No. 882. Mrs Wentworth Hope Johnstone, Skeynes, Edenbridge, Kent, Mare, "Emerald."
H. No. 888. Lady Waldie-Griffith, Hendersyde Park, Kelso, Mare, "Virtuous."
C. No. 879. J. Douglas Fletcher of Rosehaugh, Avoch, N.B., Mare, "Lady Emily."

CLASS 80. COLT, GELDING, MARE, or FILLY, foaled in 1897 or 1898, not exceeding 10½ hands.—Premiums, £5, £3, and £2.

1st. No. 892. The Ladies E. and D. Hope, Great Hollenden Farm, Underriver, Sevenoaks, Colt, "Vulcan."
2nd. No. 895. The Marquis of Londonderry, Maryfield, Bressay, Shetland, Filly, "Belinda."
3rd. No. 893. Countess of Hopetoun, Hopetoun House, South Queensferry, Colt, "Goblin."
V. No. 890. J. Douglas Fletcher of Rosehaugh, Avoch, N.B., Filly, "Naomi."
H. No. 896. R. W. R. Mackenzie, Earlshall, Leuchars, Filly, "Lucy."
C. No. 889. J. A. Campbell, Craigie House, Ayr, Filly, "Trilby."

DRIVING COMPETITIONS.

CLASS 81. YELD MARE, FILLY, or GELDING, in HARNESS, 15 hands and upwards, to be driven in the ring.—Premiums, £10, £5, and £3.

1st. No. 797. Tom Mitchell, The Park, Eccleshill, Bradford, Gelding, "Sam Weller."
2nd. No. 792. Alexander Gemmell, Chelston, Ayr, Mare, "Dusky Queen."

3rd. No. 899. Alexander Morton, Gowanbank, Darvel, Mare, "Lady Newbie" (12,016).
H. No. 803. Edward Ostlere, Kirkcaldy, Mare, "Burton Fashion."

Best Pony, under 12 *hands, in Harness, in Class* 82—£10.
Given by Captain Dundas.

No. 852. Thomas H. Bennett, Knowehead, Uddingston, Gelding, "Peter."

CLASS 82. YELD MARE, FILLY, or GELDING, in HARNESS, under 15 hands, to be driven in the ring.—Premiums, £10, £5, and £3.

1st. No. 829. Mrs Fred. Holmes, Staveley Grange, Shipley, Yorkshire, Mare, "Love Letter" (11,028).
2nd. No. 810. Arthur E. Evans, Bronwylfa, Wrexham, Mare, "Sonata" (10,516).
3rd. No. 834. Alexander Morton, Gowanbank, Darvel, Mare, "Rebecca."
V. No. 819. W. G. Storey, Clarendon Hotel, Edinburgh, Gelding, "Lord Clarendon."
H. No. 815. J. A. Mather, Grovehill Stud Farm, Thornhill, Dumfriesshire, N.B., Gelding, "Claud Duval."
C. No. 813. James Henderson, Bridge Street, Sunderland, Mare, "Daisy Belle."
C. No. 816. Edward Ostlere, Kirkcaldy, Mare, "Brenda" (9667).

EXTRA HORSES.

The following was Highly Recommended and a Medium Silver Medal awarded.

No. 904. W. Williams & Son, New Veterinary College, Edinburgh, Thoroughbred Colt, "Noah."

JUMPING COMPETITIONS

Wednesday, 5th July.

CLASS 1. HORSES, Open.—Premiums, £20, £10, and £5.

1. N. Morton, Ballymena, Ireland, Gelding, "Cockie Game Cock."
2. T. V. Grange, Oak House, Farndon, Chester, Gelding, "Hard Cash."
3. Charles H. Beveridge, Crombie, Dumfermline, Gelding, "Callander."

CLASS 2. PONIES, 14.3 hands and under.—Premiums, £10, £5, and £3.

1. N. Morton, Ballymena, Ireland, Mare, "Ladybird."
2. David Smallwood, Old Abbey Hotel, Whitby, Yorks, Mare, "Topthorne."
3. James Dodds, National Hotel, Kirkcaldy, Mare, "Kate."

Thursday, 6th July.

CLASS 3. HORSES, Open Handicap, hurdles and gate being raised 8 inches for the winner of the first prize, and 4 inches for the winner of the second prize, in Class 1.—Premiums, £10, £6, and £3.

1. T. V. Grange, Oak House, Farndon, Chester, Gelding, "Hard Cash."
2. J. T. Heap, Clarence Hotel, Ramsbottom, Lancs., Gelding, "Little John."
3. John Cooper, Duke Street, Hamilton, Gelding, "Bob."

CLASS 4. PONIES, 14.3 hands or under, Handicap, hurdles and gate being raised 4 inches for first-prize winner in Class 2.—Premiums, £5, £3, and £1.

1. N. Morton, Ballymena, Ireland, Mare, "Ladybird."
2. David Smallwood, Old Abbey Hotel, Whitby, Yorks, Mare, "Topthorne."
3. D. Courage, Royal Oak Bar, Aberdeen, Mare, "Silver Queen."

Friday, 7th July.

CLASS 5. HORSES, Open Handicap, hurdles and gate being raised 8 inches for the winner of the first prize, and 4 inches for the winner of the second prize, in either of Classes 1 or 3,—4 inches extra for the winner of the two first prizes in Classes 1 and 3.—Premiums, £10, £6, and £3.

1. Arthur W. Jones, Plas Hen, Gaerwar, R.S.O., Anglesea, Gelding, "Telephone."
2. J. T. Heap, Clarence Hotel, Ramsbottom, Lancs., Gelding, "Little John."
3. Sam Bailie, M.R.C.V.S., Newtonards, Co. Down, Mare, "Meta."

CLASS 6. PONIES, 14.3 hands or under, Handicap, hurdles and gate being raised 4 inches for the winner of the first prize in Class 2 or in Class 4, and 8 inches for winner of the first prize in both these Classes.—Premiums, £5, £3, and £1.

1. John Pringle, Milldamhead, Dumfries, Mare, "May Mischief."
2. J. Gordon Jameson, Ardwall, Gatehouse of Fleet, Gelding, "Watty Wudspurs."
3. John Wilson, Crownstone, Dalston, Carlisle, Mare, "Countess."

Champion Prize of £10 *for most points in Prizes with one or more Horses in above Classes*—First Prize to count three points; Second Prize, two points; and Third Prize, one point. The money to be evenly divided in the event of a tie.

N. Morton, Ballymena, Ireland.

Wednesday Evening at 7 p.m.

CLASS 1. HORSES, Open.—Premiums, £7, £5, £3, and £2.

1. John Cooper, Duke Street, Hamilton, Gelding, "Bob."
2. Hugh Rainy, Rainsford, Ballymena, Ireland, Mare, "His Excellency."
3. Hugh Rainy, Rainsford, Ballymena, Ireland, Mare, "Glenarriff."
4. Sam Bailie, M.R.C.V.S., Newtonards, Co. Down, Ireland, Gelding, "Ulverston 2nd."

CLASS 2. PONIES, 14.3 hands and under.—Premiums, £5, £3, and £2.

1. Sam Bailie, M.R.C.V.S., Newtonards, Co. Down, Ireland, Mare, "Knockabout."
2. David Smallwood, Old Abbey Hotel, Whitby, Yorks, Mare, "Topthorne."
3. John Wilson, Crownstone, Dalston, Carlisle, Mare, "Countess."

Thursday Evening at 7 p.m.

CLASS 3. HORSES, Open.—Premiums, £5, £3, and £2.

1. J. T. Heap, Clarence Hotel, Ramsbottom, Lancs., Gelding, "Little John."
2. John Cooper, Duke Street, Hamilton, Gelding, "Bob."
3. N. Morton, Ballymena, Ireland, Mare, "Ladybird."

CLASS 4. PONIES, 14.3 hands and under.—Premiums, £3, £2, and £1.

1. David Courage, Royal Oak Bar, Aberdeen, Mare, "Silver Queen."
2. J. Gordon Jameson, Ardwall, Gatehouse of Fleet, Gelding, "Watty Wudspurs."
3. Sam Bailie, M.R.C.V.S., Newtonards, Co. Down, Ireland, Mare, "Knockabout."

SHEEP

BLACKFACED.

PRINCE OF WALES GOLD MEDAL for best Pen of Blackfaced Sheep.

No. 907. Charles Howatson of Glenbuck, N.B.

Best Group of Five Blackfaced Tups, any age, bred by Exhibitor, and never away from or out of the Breeder's possession, in Classes 83, 84, *and* 85—The Breeders' Prize of £20, given by Mr C. Howatson of Glenbuck.

No. 907. Charles Howatson of Glenbuck.

To Shepherds in charge of Prize-Winners in Classes 83, 84, 85, 86, *and* 87—Prizes of £4, £2, and £1, given by Mr C. Howatson of Glenbuck.

1st. John Clark, Shepherd to Charles Howatson of Glenbuck.
2nd. James Hope, Shepherd to Charles Howatson of Glenbuck.
3rd. David Brown, Shepherd to R. & J. Cadzow, Borland.

CLASS 83. TUP, above two Shear.—Premiums, £12, £8, and £4. Given by Mr D. T. Martin of Girgenti.

1st. No. 907. Charles Howatson of Glenbuck, N.B.
2nd. No. 908. William Mitchell, Hazelside, Douglas, N.B., "Sixty."
3rd. No. 911. Robert M. Richmond, Drumshang, Ayr, "Multum in Parvo."
V. No. 906. James Duncan, Balfour, Brechin.

H. No. 910. Tom Rawlinson, Park House, Kirkby Lonsdale, "Borland's Hope.
C. No. 905. Thos. T. Brydon, Burncastle, Lauder, "Gold-digger."
C. No. 909. Lord Polwarth, Keithhill, Upper Keith.

CLASS 84. Two Shear TUP.—Premiums, £12, £8, £4, and £2.

1st. No. 924. Charles Howatson of Glenbuck, N.B.
2nd. No. 921. Charles Howatson of Glenbuck, N.B.
3rd. No. 915. J. Archibald, Overshiels, Stow.
4th. No. 912. J. & W. W. Anderson, Reddings, Moffat, "The Sirdar."
V. No. 922. Charles Howatson of Glenbuck, N.B.
H. No. 925. Robert Lees, Lagg, Ayr.
C. No. 913. J. Archibald, Overshiels, Stow.
C. No. 914. J. Archibald, Overshiels, Stow.

CLASS 85. SHEARLING TUP.—Premiums, £12, £8, £4, and £2.

1st. No. 957. Charles Howatson of Glenbuck, N.B.
2nd. No. 934. R. & J. Cadzow, Borland and Weston, Dunsyre.
3rd. No. 950. Charles Howatson of Glenbuck, N.B.
4th. No. 956. Charles Howatson of Glenbuck, N.B.
V. No. 955. Charles Howatson of Glenbuck, N.B.
H. No. 935. R. & J. Cadzow, Borland and Weston, Dunsyre.
C. No. 946. Jas. Hamilton, Woolfords, Cobbinshaw.

CLASS 86. EWE, above one Shear, with her Lamb at foot.—
Premiums, £10, £5, and £2.

1st. No. 978. Charles Howatson of Glenbuck, N.B.
2nd. No. 973. R. & J. Cadzow, Borland and Weston, Dunsyre.
3rd. No. 975. George Campbell-Irons, Spittal, Penicuik, "Miss Vickers."
V. No. 981. Charles Howatson of Glenbuck, N.B.
H. No. 985. R. Sinclair Scott, Flatt Farm, Largs, Ayrshire.
C. No. 976. George Campbell-Irons, Spittal, Penicuik, "Gladys."

CLASS 87. SHEARLING EWE or GIMMER.—Premiums, £10, £5, and £2.

1st. No. 995. Charles Howatson of Glenbuck, N.B.
2nd. No. 996. Charles Howatson of Glenbuck, N.B.
3rd. No. 993. William Gibson, Beoch, Stranraer.
V. No. 997. Charles Howatson of Glenbuck, N.B.
H. No. 1002. Robert M. Richmond, Drumshang, Ayr.
C. No. 991. Duncan Campbell, Elie.

CHEVIOT.

PRINCE OF WALES GOLD MEDAL for best Pen of Cheviot Sheep.

No. 1009. John Elliot, Hindhope, Jedburgh.

Best pen of Cheviot Sheep in Classes 88, 89, 90, *and* 91—Prize of £10, given by Cheviot Breeders, per Mr J. A. Borthwick.

No. 1009. John Elliot, Hindhope, Jedburgh.

CLASS 88. TUP, above one Shear.—Premiums, £12, £8, £4, and £2.

1st. No. 1009. John Elliot, Hindhope, Jedburgh.
2nd. No. 1023. J. & J. R. C. Smith, Mowhaugh, Yetholm.
3rd. No. 1022. John Robson, Newton, Bellingham.
4th. No. 1007. John Elliot, Hindhope, Jedburgh.

CLASS 89. SHEARLING TUP.—Premiums, £12, £8, £4, and £2.

1st. No. 1044. John Robson, Newton, Bellingham.
2nd. No. 1029. John Elliot, Hindhope, Jedburgh.
3rd. No. 1040. Jacob Robson, Byrness, Otterburn, Northumberland.
4th. No. 1039. Jacob Robson, Byrness, Otterburn, Northumberland.

CLASS 90. EWE, above one Shear, with her Lamb at foot.—Premiums, £10, £5, and £2.

1st. No. 1054. John Elliot, Hindhope, Jedburgh.
2nd. No. 1062. Jacob Robson, Byrness, Otterburn, Northumberland.
3rd. No. 1063. Jacob Robson, Byrness, Otterburn, Northumberland.

CLASS 91. SHEARLING EWE or GIMMER.—Premiums, £10, £5, and £2.

1st. No. 1076. Matthew S. M'Kerrow, Boreland of Southwick, Dumfries.
2nd. No. 1070. John Elliot, Hindhope, Jedburgh.
3rd. No. 1084. John Robson, Newton, Bellingham.

BORDER LEICESTER.

PRINCE OF WALES GOLD MEDAL for best Pen of Border Leicesters.

No. 1183. David Hume, Barrelwell, Brechin.

CLASS 92. TUP, above one Shear.—Premiums, £12, £8, £4, and £2

1st. No. 1096. Robert Taylor, Pitlivie Farm, Carnoustie.
2nd. No. 1099. Thomas Winter, Springfield House, Sherburn, York, "Springfield Mertoun."
3rd. No. 1094. T. M'Intosh, Balquharn, Brechin, "Polwarth Prince."
4th. No. 1098. Matthew Templeton, Drumore, Kirkcudbright.
V. No. 1090. John Best, Warriston House, Edinburgh, "Watchman."
H. No. 1095. R & J. Shennan, Balig, Kirkcudbright, "Goshawk."
C. No. 1097. Matthew Templeton, Drumore, Kirkcudbright.

CLASS 93. SHEARLING TUP.—Premiums, £12, £8, £4, and £2.

1st. No. 1118. Robert Wallace, Auchenbrain, Mauchline.
2nd. No. 1126. T. M'Intosh, Balquharn, Brechin.
3rd. No. 1146. Robert Wallace, Auchenbrain, Mauchline.
4th. No. 1108. Thomas Clark, Oldhamstocks Mains, Cockburnspath.
V. No. 1102. The Right Hon. A. J. Balfour, M.P., Whittinghame, Prestonkirk.
H. No. 1134. The Earl of Rosebery, K.G., Dalmeny Park, Edinburgh.
C. No. 1147. Robert Wallace, Auchenbrain, Mauchline.

CLASS 94. EWE, above one Shear.—Premiums, £10, £5, and £2.

1st. No. 1165. George Pople, Newhouse, Perth.
2nd. No. 1158. The Duke of Buccleuch and Queensberry, K.T., Dalkeith Park, Dalkeith.
3rd. No. 1160. J. Douglas Fletcher of Rosehaugh, Avoch, N.B.
V. No. 1156. The Right Hon. A. J. Balfour, M.P., Whittinghame, Prestonkirk.
H. No. 1166. George Willsher, Pitpointie, Dundee.
C. No. 1164. James Nisbet, Lambden, Greenlaw.

CLASS 95. SHEARLING EWE or GIMMER.—Premiums, £10, £5, and £2.

1st. No. 1183. David Hume, Barrelwell, Brechin.
2nd. No. 1171. Thomas Clark, Oldhamstocks Mains, Cockburnspath.
3rd. No. 1180. William Ford, Fentonbarns, Drem.
V. No. 1170. The Right Hon. A. J. Balfour, M.P., Whittinghame, Prestonkirk.
H. No. 1184. David Hume, Barrelwell, Brechin.
C. No. 1201. Thomas Winter, Springfield House, Sherburn, York.

HALF-BRED.

PRINCE OF WALES GOLD MEDAL for best Pen of Half-Breds.

No. 1205. James A. W. Mein, Hunthill, Jedburgh.

Best Half-Bred Tup in Classes 96 *and* 97—£5, given by Breeders, per Mr John Bertram.

No. 1205. James A. W. Mein, Hunthill, Jedburgh.

CLASS 96. TUP, above one Shear.—Premiums, £12, £8, £4, and £2.

1st No. 1205. James A. W. Mein, Hunthill, Jedburgh.
2nd. No. 1203. L. Morley Crossman, Goswick House, Beal, R.S.O., Northumberland.
3rd. No. 1202. Alexander Crosbie, Blegbie, Upper Keith, East Lothian.

CLASS 97. SHEARLING TUP.—Premiums, £12, £8, £4, and £2.

1st. No. 1207. John Bertram, Addinston, Lauder.
2nd. No. 1224. Henry H. Scott, Hepsburn, Lesbury.
3rd. No. 1213. Andrew T. Elliot, Newhall, Galashiels.
4th. No. 1206. John Bertram, Addinston, Lauder.
V. No. 1226. W. M. Tress, Faugh Hill, Newton St Boswells.
H. No. 1214. Andrew T. Elliot, Newhall, Galashiels.
C. No. 1208. John Bertram, Addinston, Lauder.

Best Half-Bred Ewe or Gimmer in Classes 98 *and* 99—£5, given by Breeders, per Mr John Bertram.

No. 1242. John Bertram, Addinston, Lauder.

CLASS 98. EWE, above one Shear.—Premiums, £10, £5, and £2.

1st. No. 1232. Robert Dickinson, Longcroft, Lauder.
2nd. No. 1231. Robert Dickinson, Longcroft, Lauder.
3rd. No. 1238. James A. W. Mein, Hunthill, Jedburgh.
V. No. 1233. Wm. Elliot, Raecleugh Head, Duns.
H. No. 1234. Wm. Elliot, Raecleugh Head, Duns.
H. No. 1240. Henry H. Scott, Hepsburn, Lesbury.

CLASS 99. SHEARLING EWE or GIMMER.—Premiums, £10, £5, and £2.

1st. No. 1242. John Bertram, Addinston, Lauder.
2nd. No. 1261. James A. W. Mein, Hunthill, Jedburgh.
3rd. No. 1251. William Elliot, Raecleugh Head, Duns.
V. No. 1262. James A. W. Mein, Hunthill, Jedburgh.
H. No. 1250. Robert Dickinson, Longcroft, Lauder.
C. No. 1249. Robert Dickinson, Longcroft, Lauder.

SHROPSHIRE.

PRINCE OF WALES GOLD MEDAL for best Pen of Shropshires.

No. 1310. Alfred Tanner, Shrawardine, Shrewsbury.

CLASS 100. TUP, above one Shear.—Premiums, £6, £4, and £2.

1st. No. 1269. Alfred Tanner, Shrawardine, Shrewsbury, "Diamond King" (9142).
2nd. No. 1263. David Buttar, Corston, Coupar-Angus.
3rd. No. 1264. David Buttar, Corston, Coupar-Angus.
V. No. 1267. George Loyd Foster Harter, Puchrup Hall Farm, Tewkesbury.
H. No. 1268. Lord Polwarth, Humbie, Upper Keith.
C. No. 1265. D. J. Thomson Gray, Innerpeffray Lodge, Crieff.

CLASS 101. SHEARLING TUP.—Premiums, £6, £4, and £2.

1st. No. 1271. David Buttar, Corston, Coupar-Angus.
2nd. No. 1278. Philo L. Mills, Ruddington Hall, Ruddington, Nottingham.
3rd. No. 1285. The Earl of Strathmore, Home Farm, Glamis Castle, Glamis.
V. No. 1286. Alfred Tanner, Shrawardine, Shrewsbury.
H. No. 1272. David Buttar, Corston, Coupar-Angus.
H. No. 1283. The Earl of Strathmore, Glamis Castle, Glamis.
C. No. 1282. The Earl of Strathmore, Glamis Castle, Glamis.

CLASS 102. EWE, above one Shear.—Premiums, £5, £3, and £2.

1st. No. 1292. Philo L. Mills, Ruddington Hall, Ruddington, Nottingham.
2nd. No. 1296. Alfred Tanner, Shrawardine, Shrewsbury.
3rd. No. 1289. David Buttar, Corston, Coupar-Angus.
V. No. 1295. Alfred Tanner, Shrawardine, Shrewsbury.
H. No. 1291. George Loyd Foster Harter, Puchrup Hall Farm, Tewkesbury.

C. No. 1288. David Buttar, Corston, Coupar-Angus.
C. No. 1290. George Loyd Foster Harter, Puchrup Hall Farm, Tewkesbury.
C. No. 1293. The Earl of Strathmore, Glamis Castle, Glamis.

CLASS 103. SHEARLING EWE or GIMMER.—Premiums, £5, £3, and £2.

1st. No. 1307. Alfred Tanner, Shrawardine, Shrewsbury.
2nd. No. 1297. David Buttar, Corston, Coupar-Angus.
3rd. No. 1308. Alfred Tanner, Shrawardine, Shrewsbury.
V. No. 1302. Philo L. Mills, Ruddington Hall, Ruddington, Nottingham.
H. No. 1298. David Buttar, Corston, Coupar-Angus.
H. No. 1299. David Buttar, Corston, Coupar-Angus.
C. No. 1303. Lord Polwarth, Humbie, Upper Keith.
C. No. 1306. The Earl of Strathmore, Glamis Castle, Glamis.

CLASS 104. Pen of five SHEARLING RAMS.—Premium, £10. Given by Shropshire Sheep-Breeders' Association.

1st. No. 1310. Alfred Tanner, Shrawardine, Shrewsbury.

OXFORD DOWNS.

PRINCE OF WALES GOLD MEDAL for best Pen of Oxford Downs.

No. 1320. John & Samuel Treadwell, Winchendon, Aylesbury.

CLASS 105. SHEARLING TUP.—Premiums, £6, £4, and £2.

1st. No. 1320. John & Samuel Treadwell, Winchendon, Aylesbury.
2nd. No. 1319. John & Samuel Treadwell, Winchendon, Aylesbury.
3rd. No. 1321. John & Samuel Treadwell, Winchendon, Aylesbury.
H. No. 1314. The Right Hon. Arthur J. Balfour, M.P., of Whittinghame, Prestonkirk.
C. No. 1315. The Right Hon. Arthur J. Balfour, M.P., of Whittinghame, Prestonkirk.

CLASS 106. SHEARLING EWE or GIMMER.—Premiums, £5, £3, and £2.

1st. No. 1325. The Right Hon. Arthur J. Balfour, M.P., Whittinghame, Prestonkirk.
2nd. No. 1324. The Right Hon. Arthur J. Balfour, M.P., Whittinghame, Prestonkirk.
3rd. No. 1322. Peter Amos, Langton, Gainford, Darlington.
H. No. 1323. Peter Amos, Langton, Gainford, Darlington.
C. No. 1327. Walter Elliot, Hollybush, Galashiels.

SUFFOLK.

PRINCE OF WALES GOLD MEDAL for best Pen of Suffolk Sheep.

No. 1331. The Earl of Ellesmere, Stetchworth Park, Newmarket, Cambs.

CLASS 107. SHEARLING TUP.—Premiums, £6, £4, and £2.

1st. No. 1331. The Earl of Ellesmere, Stetchworth Park, Newmarket, Cambs.
2nd. No. 1332. T. Goodchild, Great Meldham Hall, Halstead, Essex, "Gunnes Boy" (5186).
3rd. No. 1330. The Earl of Ellesmere, Stetchworth Park, Newmarket, Cambs.
C. No. 1329. John Ainslie, Temple Hall, Ormiston, East Lothian, "Gunner of Stetchworth 23-98" (4907).

CLASS 108. SHEARLING EWE or GIMMER.—Premiums, £5, £3, and £2.

1st. No. 1334. The Earl of Ellesmere, Stetchworth Park, Newmarket, Cambs.
2nd. No. 1333. The Earl of Ellesmere, Stetchworth Park, Newmarket, Cambs.
3rd. No. 1337. T. Goodchild, Great Meldham Hall, Halstead, Essex.
V. No. 1338. T. Goodchild, Great Meldham Hall, Halstead, Essex.
H. No. 1336. William Ford, Fentonbarns, Drem.
C. No. 1335. William Ford, Fentonbarns, Drem.

CLASS 109. THREE EWE LAMBS.—Premiums, £5, £3, and £2. Given by the Suffolk Sheep Society.

1st. No. 1342. T. Goodchild, Great Meldham Hall, Halstead, Essex.
2nd. No. 1340. The Earl of Ellesmere, Stetchworth Park, Newmarket, Cambs.
3rd. No. 1341. William Ford, Fentonbarns, Drem.
H. No. 1339. John Ainslie, Temple Hall, Ormiston, East Lothian.

EXTRA SECTIONS.

Best Pen of Lambs in Class 113 *got by a Suffolk Tup, and out of Cheviot or Blackfaced Ewes*—Prize of £5, given by the Suffolk Sheep Society.

No. 1367. John Ainslie, Temple Hall, Ormiston (Suffolk out of Cheviot Ewe).

Best Pen of Lambs in Class 113 *got by a Suffolk Tup and out of Border Leicester, Half-bred, or Three-parts-bred Ewes*—Prize of £5, given by the Suffolk Sheep Society.

No. 1381. John Turnbull, jun., Berryhill, Kelso (Suffolk Cross).

Best Pens of Cross-bred Lambs in Class 113 *got by a Shropshire Tup*—Prizes of £6, £4, and £2, given by Scotch Breeders, per Mr David Buttar.

1st. No. 1370. Alexander Anderson, Berryhill, Dundee (Shropshire Ram out of Dorset Horn Ewes).
2nd. No. 1369. Alexander Anderson, Berryhill, Dundee (Shropshire Ram out of Dorset Horn Ewes).
3rd. No. 1373. George F. Barron, Meikle Endovie, Alford, N.B. (Shropshire Cross).

Best Pens of Cross-bred Lambs in Class 113 *got by an Oxford-Down Tup*—Prizes of £5, £3, and £2, given by Oxford Down Sheep-Breeders' Association.

1st. No. 1375. James Elliot, Duncrahill, Pencaitland (by Oxford Ram and Half-bred Ewe).
2nd. No. 1379. R. D. Thom, Pitlochie, Gateside, Fife (by Oxford Ram out of Half-bred Ewe).
3rd. No. 1376. James Elliot, Duncrahill, Pencaitland (by Oxford Ram and Half-bred Ewe).

To Shepherds in charge of the Prize-winners in Class 110—Prizes of £4, £2, and £1, given by Mr C. Howatson of Glenbuck.

1st. Shepherd to Sir John Gilmour of Montrave, Bart.
2nd. Shepherd to Sir John Gilmour of Montrave, Bart.
3rd. Shepherd to Sir John Gilmour of Montrave, Bart.

CLASS 110. Three BLACKFACED WETHERS, one Shear.—Premiums, £5 and £3.

1st. No. 1350. Sir John Gilmour of Lundin and Montrave, Bart., Leven.
2nd. No. 1349. Sir John Gilmour of Lundin and Montrave, Bart., Leven.
V. No. 1351. Sir John Gilmour of Lundin and Montrave, Bart., Leven.
H. No. 1346. George F. Barron, Meikle Endovie, Alford, N.B.
C. No. 1344. William Baird of Elie, Fife.

CLASS 111. Three CHEVIOT WETHERS, one Shear.—Premiums, £5 and £3.

1st. No. 1356. James Shields, Dolphington, Tranent.
2nd. No. 1354. H. W. Hope, Luffness Mains, Aberlady.
V. No. 1357. James Shields, Dolphington, Tranent.
H. No. 1358. John Turnbull, jun., Berryhill, Kelso.

CLASS 112. Three SHEARLING WETHERS, any Cross, out of Blackfaced Ewes.—Premiums, £5 and £3.

1st. No. 1363. George Miller, Nydie Mains, St Andrews (by Leicester Tup).
2nd. No. 1362. George Miller, Nydie Mains, St Andrews (by Leicester Tup).
V. No. 1365. James Simpson, Mawcarse, Milnathort (by Leicester Tup).
H. No. 1364. James Shields, Dolphington, Tranent (by Leicester Tup).

CLASS 113. Five FAT LAMBS, any Breed or Cross.—Premiums, £5 and £3.

1st. No. 1370. Alexander Anderson, Berryhill, Dundee (Shropshire Ram out of Dorset Horn Ewes).
2nd. No. 1374. The Earl of Ellesmere, Stetchworth Park, Newmarket, Cambridgeshire (Suffolk).
V. No. 1375. James Elliot, Duncrahill, Pencaitland (by Oxford Ram and Half-bred Ewe).
H. No. 1379. R. D. Thom, Pitlochie, Gateside, Fife (by Oxford Ram out of Half-bred Ewe).

WOOL

BLACKFACE WOOL.

CLASS 114. BLACKFACE WETHER WOOL, five Fleeces.—Premiums, £3, £2, and £1. Given by Sir Robert Menzies, Bart.

1st. No. 1383. William Whyte, Spott, Kirriemuir, N.B.
2nd. No. 1382. George Bullough, Isle of Rum, Oban.

CLASS 115. BLACKFACE EWE WOOL, five Fleeces.—Premiums, £3, £2, and £1. Given by Sir Robert Menzies, Bart.

1st. No. 1387. James Macfarlane, Elibank, Walkerburn.
2nd. No. 1386. R. C. Munro Ferguson of Novar, M.P., Evanton.
3rd. No. 1381. Colonel F. G. Blair of Blair, Dalry, Ayrshire.
V. No. 1388. Lord Malcolm of Poltalloch, Lochgilphead.
H. No. 1385. Robert Dickinson, Longcroft, Lauder.

CLASS 116. BLACKFACE EWE or WETHER HOGG WOOL, five Fleeces.—Premiums, £3, £2, and £1. Given by Sir Robert Menzies, Bart.

1st. No. 1390. Colonel F. G. Blair of Blair, Dalry, Ayrshire.
2nd. No. 1393. James Macfarlane, Elibank, Walkerburn.
3rd. No. 1394. Lord Malcolm of Poltalloch, Lochgilphead.
V. No. 1392. R. C. Munro Ferguson of Novar, M.P., Evanton.
H. No. 1395. Archibald Whyte, Glenmoy, Kirriemuir, N.B.

SWINE

PRINCE OF WALES GOLD MEDAL for best Pen of Swine.

No. 1435. J. Jefferson, Peel Hall, Chester, "Peel Daisy" (6695).

LARGE WHITE BREED.

CLASS 117. BOAR.—Premiums, £5 and £3.

1st. No. 1401. Robert & Andrew Walker, East Craigs Farm, Corstorphine, "Metchley Ladas" (3575).
2nd. No. 1397. Sir Gilbert Greenall, Bart., Walton Hall, Warrington, "Walton Eclipse II."
V. No. 1399. The Earl of Rosebery, K.G., Dalmeny Park, Edinburgh, "Dalmeny Rover."
H. No. 1400. A. Enever Todd, Stoneybank, Musselburgh, "Holywell Edinburgh" (5101).

CLASS 118. SOW.—Premiums, £5 and £3.

1st. No. 1403. Sir Gilbert Greenall, Bart., Walton Hall, Warrington, "Walton Belle II." (6776).
2nd. No. 1409. Robert & Andrew Walker, East Craigs Farm, Corstorphine, "Miss Hollingworth 54th" (7444).
V. No. 1408. The Earl of Rosebery, K.G., Dalmeny Park, Edinburgh, "Dalmeny Empress 10th" (7964).
H. No. 1402. George Graham, Manshall Hall, Wigton, Cumberland, "Manshall Empress II." (8072).

H. No. 1407. The Earl of Rosebery, K.G., Dalmeny Park, Edinburgh, "Dalmeny Empress 5th" (7290).
C. No. 1406. The Earl of Rosebery, K.G., Dalmeny Park, Edinburgh, "Borrowfield Sunbeam 2nd" (7230).

CLASS 119. Three PIGS, not above 8 months old.—Premiums, £4 and £2.

1st. No. 1414. The Earl of Rosebery, K.G., Dalmeny Park, Edinburgh.
2nd. No. 1410. Sir Gilbert Greenall, Bart., Walton Hall, Warrington.
V. No. 1413. The Earl of Rosebery, K.G., Dalmeny Park, Edinburgh.
H. No. 1415. A. Enever Todd, Stoneybank, Musselburgh.

WHITE BREED OTHER THAN LARGE.

CLASS 120. BOAR.—Premiums, £5 and £3.

1st. No. 1417. Sir Gilbert Greenall, Bart., Walton Hall, Warrington, "Walton Royal."
2nd. No. 1418. Robert & Andrew Walker, East Craigs Farm, Corstorphine, "East Craigs' King."

CLASS 121. SOW.—Premiums, £5 and £3.

1st. No. 1419. Sir Gilbert Greenall, Bart., Walton Hall, Warrington, "Walton Mayflower IV."
2nd. No. 1420. Robert & Andrew Walker, East Craigs Farm, Corstorphine, "Moss Rose."

CLASS 122. Three PIGS, not above 8 months old.—Premiums, £4 and £2.

1st. No. 1422. H.R.H. The Prince of Wales, K.G., Sandringham, Norfolk.
2nd. No. 1421. Sir Gilbert Greenall, Bart., Walton Hall, Warrington.

BERKSHIRE.

CLASS 123. BOAR.—Premiums, £5 and £3.

1st. No. 1429. Lord Polwarth, Humbie, Upper Keith.
2nd. No. 1428. J. Jefferson, Peel Hall, Chester, "Peel Charlie" (6705).
V. No. 1427. J. Jefferson, Peel Hall, Chester, "Peel Hallie" (5877).
H. No. 1425. Captain G. D. Clayhills Henderson of Invergowrie, R.N., Dundee.
C. No. 1423. W. Campbell, 191 Perth Road, Dundee, "Sam."

CLASS 124. SOW.—Premiums, £5 and £3.

1st. No. 1435. J. Jefferson, Peel Hall, Chester, "Peel Daisy" (6695).
2nd. No. 1436. J. Jefferson, Peel Hall, Chester, "Peel Matchless."
V. No. 1430. W. Campbell, 191 Perth Road, Dundee, "May III."
H. No. 1432. William Dow, 18 Hawkhill, Dundee, "Dora."
C. No. 1437. Lord Polwarth, Humbie, Upper Keith.

CLASS 125. Three PIGS, not above 8 months old.—Premiums, £4 and £2.

1st. No. 1440. J. Jefferson, Peel Hall, Chester.
2nd. No. 1438. W. Campbell, 191 Perth Road, Dundee.
V. No. 1439. W. Campbell, 191 Perth Road, Dundee.
C. No. 1441. J. Jefferson, Peel Hall, Chester.

POULTRY

First Premium—*One Sovereign*. Second Premium—*Ten Shillings*. And where there are Six or more entries, Third Premium—*Five Shillings*.

PRINCE OF WALES SILVER MEDALS.

1. *Best Cock, any variety.*

No. 476. David M'Gibbon, Ard-na-Craig, Campbeltown (Spanish).

2. *Best Hen, any variety.*

No. 417. Robert Fitton, Ribby Hall, Kirkham, Lancashire.

3. *Best Cockerel, any variety.*

No. 22. Robert Fitton, Ribby Hall, Kirkham, Lancashire.

4. *Best Pullet, any variety.*

No. 29. A. K. Crichton, Glamis.

5. *Best Pen of Ducks.*

No. 497. John Gillies, Edington Mills, Chirnside.

6. *Best Pen of Geese.*

No. 524. James Dow, Clathybeg, Auchterarder (Embden).

7. *Best Pen of Turkeys.*

No. 545. George A. Bell, Lundin Mill Farm, Largo (American Bronze).

CLASS 1. DORKING, Coloured. Cock.

1st. No. 6. John Gillies, Edington Mills, Chirnside.
2nd. No. 4. Robert Fitton, Ribby Hall, Kirkham, Lancashire.
3rd. No. 10. M. B. Thomson, Park, Renfrew.
V. No. 1. J. T. Cathcart, Dunbog House, Newburgh, Fife.
H. No. 5. John Gillies, Edington Mills, Chirnside.
C. No. 2. John Craig, Miller Street, Wishaw Central.

CLASS 2. DORKING, Coloured. Hen.

1st. No. 16. M. B. Thomson, Park, Renfrew.
2nd. No. 12. Robert Fitton, Ribby Hall, Kirkham, Lancashire.
3rd. No. 14. John Gillies, Edington Mills, Chirnside.
V. No. 13. John Gillies, Edington Mills, Chirnside.
H. No. 11. A. K. Crichton, Glamis.
C. No. 15. Richardson Brothers, Muir, Bannockburn.

CLASS 3. DORKING, Coloured. Cockerel.

1st. No. 22. Robert Fitton, Ribby Hall, Kirkham, Lancashire.
2nd. No. 26. M. B. Thomson, Park, Renfrew.
3rd. No. 18. J. T. Cathcart, Dunbog House, Newburgh, Fife.
V. No. 21. A. K. Crichton, Glamis.
H. No. 19. J. T. Cathcart, Dunbog House, Newburgh, Fife.
C. No. 25. Alexander Sim, Crown Inn, Elgin.

CLASS 4. DORKING, Coloured. Pullet.

1st. No. 29. A. K. Crichton, Glamis.
2nd. No. 33. John Gillies, Edington Mills, Chirnside.
3rd. No. 28. J. T. Cathcart, Dunbog House, Newburgh, Fife.
V. No. 32. Robert Fitton, Ribby Hall, Kirkham, Lancashire.
H. No. 34. M. B. Thomson, Park, Renfrew.
C. No. 30. A. K. Crichton, Glamis.

CLASS 5. DORKING, Silver Grey. Cock.

1st. No. 36. Robert Fitton, Ribby Hall, Kirkham, Lancashire.
2nd. No. 39. David M'Gibbon, Ard-na-Craig, Campbeltown.
3rd. No. 42. Richardson Brothers, Muir, Bannockburn.
V. No. 40. John Mechie, jun., Auchtermuchty.
H. No. 44. M. B. Thomson, Park, Renfrew.
C. No. 41. Thomas Rae, Craighlaw, Kirkcowan.

CLASS 6. DORKING, Silver Grey. Hen.

1st. No. 47. Robert Fitton, Ribby Hall, Kirkham, Lancashire.
2nd. No. 50. George M'Bain, Linkwood, Elgin.
3rd. No. 49. John Howie, jun., Knowhead, Craigie, by Kilmarnock.

V. No. 54. John Mechie, jun., Auchtermuchty.
H. No. 52. David M'Gibbon, Ard-na-Craig, Campbeltown.
C. No. 48. John Howie, jun., Knowhead, Craigie, by Kilmarnock.

CLASS 7. DORKING, Silver Grey. Cockerel.

1st. No. 59. Robert Fitton, Ribby Hall, Kirkham, Lancashire.
2nd. No. 62. Thomas Rae, Craighlaw, Kirkcowan.
3rd. No. 64. M. B. Thomson, Park, Renfrew.
V. No. 63. Thomas Rae, Craighlaw, Kirkcowan.
H. No. 56. Charles Aitkenhead, Stud Farm, Seaham Harbour.
C. No. 60. George M'Bain, Linkwood, Elgin.

CLASS 8. DORKING, Silver Grey. Pullet.

1st. No. 72. M. B. Thomson, Park, Renfrew.
2nd. No. 67. Robert Fitton, Ribby Hall, Kirkham, Lancashire.
3rd. No. 70. David M'Gibbon, Ard-na-Craig, Campbeltown.
V. No. 65. Charles Aitkenhead, Stud Farm, Seaham Harbour.
H. No. 68. Robert Fitton, Ribby Hall, Kirkham, Lancashire.
C. No. 69. George M'Bain, Linkwood, Elgin.

CLASS 9. COCHIN-CHINA. Cock.

1st. No. 75. Robert Fitton, Ribby Hall, Kirkham, Lancashire.
2nd. No. 78. George H. Proctor, Flass House, Durham.
3rd. No. 79. George H. Proctor, Flass House, Durham.
V. No. 74. John Ferguson, 7 North Inglis Street, Dunfermline.
H. No. 77. Robert M'Millan, Broon Coo Inn, Barrhead.
C. No. 73. John Ferguson, 7 North Inglis Street, Dunfermline.

CLASS 10. COCHIN-CHINA. Hen.

1st. No. 86. Robert M'Millan, Broon Coo Inn, Barrhead.
2nd. No. 87. George H. Proctor, Flass House, Durham.
3rd. No. 89. Welch & Bruce, 65 Crossgate, Cupar-Fife.
V. No. 84. Robert Fitton, Ribby Hall, Kirkham, Lancashire.
H. No. 82. John Ferguson, 7 North Inglis Street, Dunfermline.
C. No. 83. John Ferguson, 7 North Inglis Street, Dunfermline.

CLASS 11. BRAHMAPOOTRA. Cock.

1st. No. 95. James Logan, East Linton, Prestonkirk.
2nd. No. 91. P. Castle, Selkirk.
3rd. No. 92. John Gillies, Edington Mills, Chirnside.
V. No. 94. D. J. Thomson Gray, Innerpeffray Lodge, Crieff.
H. No. 93. John Gillies, Edington Mills, Chirnside.
C. No. 90. Mrs Walter Burns, Denholm Hill, Cauldmill, Hawick.

CLASS 12. BRAHMAPOOTRA. Hen.

1st. No. 99. John Gillies, Edington Mills, Chirnside.
2nd. No. 100. John Gillies, Edington Mills, Chirnside.
3rd. No. 102. D. J. Thomson Gray, Innerpeffray Lodge, Crieff.
V. No. 97. P. Castle, Selkirk.
H. No. 101. D. J. Thomson Gray, Innerpeffray Lodge, Crieff.
C. No. 98. P. Castle, Selkirk.

CLASS 13. BRAHMA or COCHIN. Cockerel.

1st. No. 106. D. J. Thomson Gray, Innerpeffray Lodge, Crieff (Brahma).
2nd. No. 105. John Gillies, Edington Mills, Chirnside (Brahma).
V. No. 104. John Ferguson, 7 North Inglis Street, Dunfermline (Cochin).
C. No. 103. John Ferguson, 7 North Inglis Street, Dunfermline (Cochin).

CLASS 14. BRAHMA or COCHIN. Pullet.

1st. No. 109. John Gillies, Edington Mills, Chirnside (Brahma).
2nd. No. 110. D. J. Thomson Gray, Innerpeffray Lodge, Crieff (Brahma).
H. No. 107. John Ferguson, 7 North Inglis Street, Dunfermline (Cochin).
C. No. 108. John Ferguson, 7 North Inglis Street, Dunfermline (Cochin).

CLASS 15. SCOTCH GREY. Cock.

1st. No. 112. David M'Gibbon, Ard-na-Craig, Campbeltown.
2nd. No. 114. David M'Gibbon, Ard-na-Craig, Campbeltown.
3rd. No. 113. David M'Gibbon, Ard-na-Craig, Campbeltown.
V. No. 117. Matthew Smith, Townhead, Thornhill, Dumfriesshire.
H. No. 111. David Hastings, Glaister Cottage, Darvel, Ayrshire.
C. No. 115. Archibald Mitchell, Roselea House, Airth, Larbert.

CLASS 16. SCOTCH GREY. Hen.

1st. No. 120. David Hastings, Glaister Cottage, Darvel, Ayrshire.
2nd. No. 121. David M'Gibbon, Ard-na-Craig, Campbeltown.
3rd. No. 123. David M'Gibbon, Ard-na-Craig, Campbeltown.
V. No. 126. Matthew Smith, Townhead, Thornhill, Dumfriesshire.
H. No. 119. John Craig, Main Street, Dreghorn, Ayrshire.
C. No. 125. Archibald Mitchell, Roselea House, Airth, Larbert.

CLASS 17. SCOTCH GREY. Cockerel.

1st. No. 128. William S. Mitchell, Roselea House, Airth, Larbert.
2nd. No. 129. William S. Mitchell, Roselea House, Airth, Larbert.
C. No. 131. Mrs R. W. Robin, Craigton Monumental Works, Paisley.

CLASS 18. SCOTCH GREY. Pullet.

1st. No. 135. William S. Mitchell, Roselea House, Airth, Larbert.
2nd. No. 134. William S. Mitchell, Roselea House, Airth, Larbert.
C. No. 133. John Craig, Main Street, Dreghorn, Ayrshire.

CLASS 19. HAMBURG—Black. Cock.

1st. No. 137. A. M. Blair, Craigheads, Barrhead.
2nd. No. 141. H. Pickles, Earby, Colne, Lancashire.
V. No. 138. A. M. Blair, Craigheads, Barrhead.
H. No. 140. John Gillies, Edington Mills, Chirnside.

CLASS 20. HAMBURG—Black. Hen.

1st. No. 149. H. Pickles, Earby, Colne, Lancashire.
3rd. No. 146. James Dow, 11 Castle Road, Auchterarder.
V. No. 142. A. M. Blair, Craigheads, Barrhead.
H. No. 147. John Gillies, Edington Mills, Chirnside.
C. No. 150. William Steel, 74 St Andrew's Terrace, Kilmarnock.

CLASS 21. HAMBURG—Any other Variety. Cock.

1st. No. 151. A. M. Blair, Craigheads, Barrhead (Golden).
2nd. No. 158. H. Pickles, Earby, Colne, Lancashire.
3rd. No. 157. H. Pickles, Earby, Colne, Lancashire.
V. No. 152. A. M. Blair, Craigheads, Barrhead (Silver).
H. No. 155. Jackson Brothers, Brunthwaite, near Silsden, *via* Keighley (Golden spangled).
C. No. 154. David Govan, 346 Great Eastern Road, Parkhead, Glasgow (Silver spangled).

CLASS 22. HAMBURG—Any other Variety. Hen.

1st. No. 159. A. M. Blair, Craigheads, Barrhead (Silver).
2nd. No. 160. A. M. Blair, Craigheads, Barrhead (Golden).
3rd. No. 165. H. Pickles, Earby, Colne, Lancashire.
V. No. 163. David Govan, 346 Great Eastern Road, Parkhead, Glasgow (Silver spangled).
H. No. 164. H. Pickles, Earby, Colne, Lancashire.
C. No. 162. Hugh Currie, 17 Princes Street, Ardrossan (Gold spangled).

CLASS 23. HAMBURG—Any Variety. Cockerel.

1st. No. 169. H. Pickles, Earby, Colne, Lancashire.
2nd. No. 170. William Steel, 74 St Andrew's Terrace, Kilmarnock (Silver spangled).
C. No. 168. John Gillies, Edington Mills Chirnside (Black).

CLASS 24. HAMBURG—Any Variety. Pullet.

1st. No. 174. H. Pickles, Earby, Colne, Lancashire.
2nd. No. 171. A. M. Blair, Craigheads, Barrhead (Golden).
C. No. 173. Jackson Brothers, Brunthwaite, near Silsden, *via* Keighley (Golden pencilled).

CLASS 25. PLYMOUTH ROCK. Cock.

1st. No. 179. Alexander M. Prain, Rawes, Longforgan.
2nd. No. 177. Robert Fitton, Ribby Hall, Kirkham, Lancashire.
3rd. No. 181. John B. Tulloch, The Dales, Inverkeithing.
V. No. 178. W. M. M'Call, Great Cross, Kirkcudbright.
H. No. 180. Mrs R. W. Robin, Craigton Monumental Works, Paisley Road, Govan.
C. No. 176. James Dow, Clathybeg, Auchterarder.

CLASS 26. PLYMOUTH ROCK. Hen.

1st. No. 186. Alexander M. Prain, Rawes, Longforgan.
2nd. No. 187. Mrs R. W. Robin, Craigton Monumental Works, Paisley Road, Govan.
V. No. 185. W. M. M'Call, Great Cross, Kirkcudbright.
H. No. 183. Robert Fitton, Ribby Hall, Kirkham, Lancashire.

CLASS 27. PLYMOUTH ROCK. Cockerel.

1st. No. 193. Alex. M. Prain, Rawes, Longforgan.
2nd. No. 192. Alex. M. Prain, Rawes, Longforgan.
3rd. No. 190. W. M. M'Call, Great Cross, Kirkcudbright.
V. No. 189. Mrs Thomas Lambert, Elrington Hall, Haydon Bridge.
H. No. 194. Mrs R. W. Robin, Craigton Monumental Works, Paisley Road Govan.
C. No. 195. W. Slater, Silverdale, near Carnforth, Lancashire.

CLASS 28. PLYMOUTH ROCK. Pullet.

1st. No. 205. W. Slater, Silverdale, near Carnforth, Lancashire.
2nd. No. 200. W. M. M'Call, Great Cross, Kirkcudbright.
3rd. No. 197. H. Bargh, Rigmaden Farm, near Kirkby Lonsdale.
V. No. 203. Alex. M. Prain, Rawes, Longforgan.
H. No. 202. Alex. M. Prain, Rawes, Longforgan.
C. No. 201. L. H. Nutter, Burton, Carnforth.

CLASS 29. MINORCA. Cock.

1st. No. 207. Arthur H. Blair, "Clovelly," Milngavie.
2nd. No. 210. Robert Craig, Main Street, West Kilbride, Ayrshire.
3rd. No. 208. W. H. Brown, Rothbury, Northumberland.
V. No. 215. David M'Gibbon, Ard-na-Craig, Campbeltown.
H. No. 212. Mrs Catherine Elliot, Bonkyl Lodge, Duns.
C. No. 219. Welch & Bruce, 65 Crossgate, Cupar-Fife.

CLASS 30. MINORCA. Hen.

1st. No. 221. William S. Craig, Bonnyrigg, Mid-Lothian.
2nd. No. 225. Mrs Wm. Hart, Croft Terrace, Selkirk.
3rd. No. 224. John Gillies, Edington Mills, Chirnside.
V. No. 230. Robert Paterson, Garrel Glen Cottage, Kilsyth.
H. No. 220. George Bryce, Grove End, Broomieknowe, Lasswade.
H. No. 232. Mrs Robert Pullar, 19 Peddie Street, Dundee.
C. No. 226. R. & J. Hay, 147 West Regent Street, Glasgow.

CLASS 31. MINORCA. Cockerel.

1st. No. 241. J. Smith, Dundas, South Queensferry.
2nd. No. 235. John Gillies, Edington Mills, Chirnside.
3rd. No. 233. John W. Crossman, The Shrubberies, Galphay, Ripon, Yorkshire.
V. No. 234. Mrs Catherine Elliot, Bonkyl Lodge, Duns.
C. No. 236. John Gillies, Edington Mills, Chirnside.

CLASS 32. MINORCA. Pullet.

1st. No. 244. John W. Crossman, The Shrubberies, Galphay, Ripon, Yorkshire.
2nd. No. 245. John Gillies, Edington Mills, Chirnside.
3rd. No. 248. J. Smith, Dundas, South Queensferry.
V. No. 242. Arthur H. Blair, "Clovelly," Milngavie.
H. No. 249. Thomas R. S. Waugh, Dundas Castle, South Queensferry.
C. No. 246. John Kennedy, Mouswald, Ruthwell, R.S.O.

CLASS 33. LEGHORN—White. Cock.

1st. No. 250. Glen & Gourlay, Nitshill.
2nd. No. 254. Moir Robertson, Cairneyhill, by Dunfermline.
3rd. No. 252. John King, Rodenbarn, Hollybush.
C. No. 253. William Miller, Crosshands, Mauchline.

CLASS 34. LEGHORN—White. Hen.

1st. No. 266. Moir Robertson, Cairneyhill, by Dunfermline.
2nd. No. 257. William Cox, 91 East Main Street, Darvel.
3rd. No. 260. John King, Rodenbarn, Hollybush.

CLASS 35. LEGHORN—Any other Variety. Cock.

1st. No. 272. John B. Tulloch, The Dales, Inverkeithing (Brown).
2nd. No. 271. David Millar, Bridgehouse, Riccarton, Kilmarnock.

CLASS 36. LEGHORN—Any other Variety. Hen.

1st. No. 273. A. M. Blair, Craigheads, Barrhead (Brown).
2nd. No. 277. David Millar, Bridgehouse, Riccarton, Kilmarnock.

CLASS 37. LEGHORN—Any Variety. Cockerel.

1st. No. 278. Dickson Brothers, Mouswald, Ruthwell (White).
2nd. No. 281. Welch & Bruce, 65 Crossgate, Cupar-Fife.

CLASS 38. LEGHORN—Any Variety. Pullet.

1st. No. 287. Alex. M. Prain, Rawes, Longforgan (White).
2nd. No. 288. Alex. M. Prain, Rawes, Longforgan (White).
3rd. No. 284. Alexander Borthwick, Corriedow, Tynron, Thornhill, Dumfriesshire (Brown).
C. No. 286. William Lee, Bridge Street, Galston (White).

CLASS 39. LANGSHAN. Cock.

1st. No. 294. John Smith, jun., slater, Selkirk.
2nd. No. 293. Richardson Brothers, Muir, Bannockburn.
3rd. No. 295. Andrew Wyles, High Street, Strathmiglo.
H. No. 292. John Lindsay, 151 Union Street, Cowdenbeath.
C. No. 291. Alexander Borthwick, Corriedow, Thornhill, Dumfriesshire.

CLASS 40. LANGSHAN. Hen.

1st. No. 298. John Lindsay, 151 Union Street, Cowdenbeath.
2nd. No. 299. John Smith, jun., slater, Selkirk.
C. No. 300. Andrew Wyles, High Street, Strathmiglo.

CLASS 41. ORPINGTON. Cock.

1st. No. 302. T. Lockwood, Pateley Bridge, Yorkshire.
2nd. No. 303. Alexander M. Prain, Rawes, Longforgan.
V. No. 304. John Prain, Mains Castle, Huntly, Longforgan.

CLASS 42. ORPINGTON. Hen.

1st. No. 307. T. Lockwood, Pateley Bridge, Yorkshire.
2nd. No. 306. John Gillies, Edington Mills, Chirnside.
C. No. 309. William Miller, Crosshands, Mauchline.

Class 43. LANGSHAN or ORPINGTON. Cockerel.

1st No. 311. T. Lockwood, Pateley Bridge, Yorkshire (Orpington).
2nd. No. 312. John Prain, Mains Castle, Huntly, Longforgan (Orpington).
C. No. 313. John B. Tulloch, The Dales, Inverkeithing (Buff Orpington).

Class 44. LANGSHAN or ORPINGTON. Pullet.

1st. No. 314. Alexander Borthwick, Corriedow, Tynron, Thornhill, Dumfriesshire (Langshan).
2nd. No. 317. T. Lockwood, Pateley Bridge, Yorkshire (Orpington).
3rd. No. 319. John Prain, Mains Castle, Huntly, Longforgan (Orpington).
V. No. 318. Alexander M. Prain, Rawes, Longforgan (Orpington).
H. No. 315. Colin E. Chisholm, Grange of Elcho, Perth (Orpington).
C. No. 320. John B. Tulloch, The Dales, Inverkeithing (Buff Orpington).

Class 45. WYANDOTTE—Gold or Silver. Cock.

1st. No. 324. A. W. Forrester, Gaberston, Alloa (Silver).
2nd. No. 334. H. Pickles, Earby, Colne, Lancashire (Silver).
3rd. No. 331. Rev. William M'Beath, Manse of Halkirk, Halkirk, Caithness (Silver).
V. No. 323. A. W. Forrester, Gaberston, Alloa (Silver).
H. No. 326. Thomas Hume, Lees Mills, Coldstream (Gold).

Class 46. WYANDOTTE—Gold or Silver. Hen.

1st. No. 343. H. Pickles, Earby, Colne, Lancashire (Gold).
2nd. No. 341. T. Lockwood, Pateley Bridge, Yorkshire.
3rd. No. 342. Rev. William M'Beath, Manse of Halkirk, Halkirk, Caithness (Silver).
V. No. 337. Robert Dickinson, Longcroft, Lauder (Silver).
C. No. 336. Mrs William Cæsar, Lochty, Carnoustie (Silver).

Class 47. WYANDOTTE—Any other Variety. Cock.

2nd. No. 344. James Paterson, Kidshielhaugh, Duns (White).

Class 48. WYANDOTTE—Any other Variety. Hen.

1st. No. 349. John Wharton, Honeycott, Hawes, Yorkshire (Partridge).
2nd. No. 348. T. Lockwood, Pateley Bridge, Yorkshire (White).

Class 49. WYANDOTTE—Any Variety. Cockerel.

1st. No. 357. W. & A. Thomson, Drumburn, New Abbey, Dumfries (Silver).
2nd. No. 353. Albert Mansell, Crossrig, Penrith (White).
3rd. No. 354. H. Pickles, Earby, Colne, Lancashire (Silver).
V. No. 350. Mrs William Cæsar, Lochty, Carnoustie (Silver).
H. No. 352. T. Lockwood, Pateley Bridge, Yorkshire.
C. No. 351. Mrs Kinnaird, Clockmill, Duns (Silver).

Class 50. WYANDOTTE—Any Variety. Pullet.

1st. No. 366. M. B. Thomson, Park, Renfrew (White).
2nd. No. 368. John Wharton, Honeycott, Hawes, Yorkshire (Buff).
3rd. No. 360. Robert Dickinson, Longcroft, Lauder (Silver).
V. No. 361. Robert Fitton, Ribby Hall, Kirkham, Lancashire (Silver).
H. No. 365. H. Pickles, Earby, Colne, Lancashire (Silver).
C. No. 364. Albert Mansell, Crossrigg, Penrith (White).

Class 51. GAME—Old English. Cock.

1st. No. 374. J. A. Mather, Grovehill Stud Farm, Thornhill, Dumfriesshire.
2nd. No. 369. Armstrong & Paull, 275 Watling Street, Leadgate, County Durham
3rd. No. 379. Charles W. Wilson, The Gale, Abbey Town.
V. No. 373. John Hutt, Parson's Mill, Cardenden, Fife.
H. No. 372. Thomas Garner, Old English Game Farm, Abbey Town, near Carlisle.
C. No. 370. James Davie, South Inglis Street, Dunfermline.

CLASS 52. GAME—Old English. Hen.

1st. No. 386. J. A. Mather, Grovehill Stud Farm, Thornhill, Dumfriesshire.
2nd. No. 391. Charles W. Wilson, The Gale, Abbey Town.
3rd. No. 381. Armstrong & Paull, 275 Watling Street, Leadgate, County Durham (Wheaten).
V. No. 385. John Hutt, Parson's Mill, Cardenden, Fife.
H. No. 390. Charles W. Wilson, The Gale, Abbey Town.

CLASS 53. GAME—Indian. Cock.

1st. No. 394. Rev. Wm. M'Beath, Manse of Halkirk, Halkirk, Caithness.
2nd. No. 392. James Davie, South Inglis Street, Dunfermline.
3rd. No. 393. Dr John K. Goodall, Brimington, Chesterfield.
V. No. 397. John Penman, 1 James Place, Dunfermline.
H. No. 396. J. A. Mather, Grovehill Stud Farm, Thornhill, Dumfriesshire.
C. No. 398. Alex. Scott, Mineral Cottage, Crossgates, by Dunfermline.

CLASS 54. GAME—Indian. Hen.

1st. No. 403. J. A. Mather, Grovehill Stud Farm, Thornhill, Dumfriesshire.
2nd. No. 401. Rev. Wm. M'Beath, Manse of Halkirk, Halkirk, Caithness.
3rd. No. 402. Rev. Wm. M'Beath, Manse of Halkirk, Halkirk, Caithness.
V. No. 400. Dr John K. Goodall, Brimington, Chesterfield.
H. No. 405. Alex. M. Prain, Rawes, Longforgan.
C. No. 406. Alex. Scott, Mineral Cottage, Crossgates, by Dunfermline.

CLASS 55. GAME—Modern. Cock.

1st. No. 409. Robert Fitton, Ribby Hall, Kirkham, Lancashire.
2nd. No. 412. Dr Orr, Westfield, Johnstone (Pile).
3rd. No. 408. Robert Fitton, Ribby Hall, Kirkham, Lancashire.
V. No. 414. Stewart Brothers, Abbey Mount House, Edinburgh.
H. No. 413. John Shields, 33 Sunnyside, Gallatown, Kirkcaldy.

CLASS 56. GAME—Modern. Hen.

1st. No. 417. Robert Fitton, Ribby Hall, Kirkham, Lancashire.
2nd. No. 418. J. A. Mather, Grovehill Stud Farm, Thornhill, Dumfriesshire.
3rd. No. 420. Wm. Murray & Son, Pyke, by Penicuik.
V. No. 421. Dr Orr, Westfield, Johnstone.
H. No. 422. Dr Orr, Westfield, Johnstone.
C. No. 416. Robert Fitton, Ribby Hall, Kirkham, Lancashire.

CLASS 57. GAME—Any Variety, including Old English and Indian. Cockerel.

1st. No. 427. Wm. J. Stewart, Craigie Steam Laundry, Perth (Indian Game).
2nd. No. 425. Wm. Melrose, Rosewell Mains, Rosewell, Mid-Lothian (Black Red).

CLASS 58. GAME—Any Variety, including Old English and Indian. Pullet.

1st. No. 431. Wm. J. Stewart, Craigie Steam Laundry, Perth (Indian).
2nd. No. 430. Stewart Brothers, Abbey Mount House, Edin. (Modern).

CLASS 59. BANTAM—Game, any Variety, including Old English and Indian. Cock.

1st. No. 472. Miss E. Fitton, Ribby Hall, Kirkham, Lancashire (Game Bantam).
2nd. No. 435. Wm. Murray & Son, Pyke, by Penicuik.
3rd. No. 437. Dr Orr, Westfield, Johnstone (Pile).
V. No. 471. Miss E. Fitton, Ribby Hall, Kirkham, Lancashire (Game Bantam).
V. No. 432. William Coutts, jun., Rosemount, Forfar.
H. No. 434. J. A. Mather, Grovehill Stud Farm, Thornhill, Dumfriesshire.

CLASS 60. BANTAM—Game, any Variety, including Old English and Indian. Hen.

1st. No. 481. Miss E. Fitton, Ribby Hall, Kirkham, Lancashire (Game Bantam).
2nd. No. 442. Dr Orr, Westfield, Johnstone (Duckwing).
3rd. No. 438. William Coutts, jun., Rosemount, Forfar.

V. No. 482. Miss E. Fitton, Ribby Hall, Kirkham, Lancashire (Game Bantam).
H. No. 440. Wm. Murray & Son, Pyke, Penicuik.
C. No. 441. Dr Orr, Westfield, Johnstone.

CLASS 61. BANTAM—Any other Variety Bantam. Cock.

1st. No. 445. David Fulton, Strawberry Bank, Kilmarnock (Black Rosecomb).
2nd. No. 452. M. B. Thomson, Park, Renfrew (Sebright).
3rd. No. 446. James Gibson, Dipple Knowe, Girvan (Pekin).
V. No. 451. Andrew Richmond, M.B., 9 St James Place, Paisley (Pekin).
H. No. 444. Robert Frew, The Barony, Cupar-Fife (Frizzle).

CLASS 62. BANTAM—Any other Variety Bantam. Hen.

1st. No. 460. James Gibson, Dipple Knowe, Girvan (Pekin).
2nd. No. 467. M. B. Thomson, Park, Renfrew (Sebright).
3rd. No. 458. Mrs Catherine Elliot, Bonkyl Lodge, Duns (Sebright).
V. No. 462. John Gillies, Edington Mills, Chirnside (Black Rosecomb).
H. No. 461. John Gillies, Edington Mills, Chirnside (Sebright).
C. No. 463. J. A. Mather, Grovehill Stud Farm, Thornhill, Dumfriesshire.

CLASS 63. Any other recognised Breed of Poultry. Cock.

1st. No. 476. David M'Gibbon, Ard-na-Craig, Campbeltown (Spanish).
2nd. No. 473. Robert Fitton, Ribby Hall, Kirkham, Lancashire (Poland).
3rd. No. 474. David Hastings, Glaister Cottage, Darvel, Ayrshire (Crere).
V. No. 479. Master A. Mitchell, The Bush, Rothesay (Silver Poland).
H. No. 475. George Leven, St Quivox, Ayr (Ancona).

CLASS 64. Any other recognised Breed of Poultry. Hen.

1st. No. 487. David M'Gibbon, Ard-na-Craig, Campbeltown (Spanish).
2nd. No. 484. David Hastings, Glaister Cottage, Darvel, Ayrshire (Crere).
3rd. No. 490. James Paterson, Kidshielhaugh, Duns (Ancona).
V. No. 480. James Davie, South Inglis Street, Dunfermline (White Dorking).
H. No. 483. Robert Fitton, Ribby Hall, Kirkham, Lancashire (Poland).
C. No. 486. T. Lockwood, Pateley Bridge, Yorkshire (Spanish).

CLASS 65. Any other recognised Breed of Poultry. Cockerel.

2nd. No. 492. David M'Gibbon, Ard-na-Craig, Campbeltown (Spanish).

CLASS 66. Any other recognised Breed of Poultry. Pullet.

1st. No. 493. David M'Gibbon, Ard-na-Craig, Campbeltown (Spanish).

CLASS 67. DUCKS—Aylesbury. Drake.

1st. No. 495. John Gillies, Edington Mills, Chirnside.
2nd. No. 494. John Gillies, Edington Mills, Chirnside.
V. No. 496. Lord Polwarth, Humbie, Upper Keith.

CLASS 68. DUCKS—Aylesbury. Duck.

1st. No. 497. John Gillies, Edington Mills, Chirnside.
2nd. No. 498. John Gillies, Edington Mills, Chirnside.

CLASS 69. DUCKS—Aylesbury. Drake (Young).

1st. No. 500. John Gillies, Edington Mills, Chirnside.
2nd. No. 501. John Gillies, Edington Mills, Chirnside.
V. No. 502. James Paterson, Kidshielhaugh, Duns.

CLASS 70. DUCKS—Aylesbury. Duck (Young).

1st. No. 504. John Gillies, Edington Mills, Chirnside.
2nd. No. 503. John Gillies, Edington Mills, Chirnside.
C. No. 505. James Paterson, Kidshielhaugh, Duns.

Class 71. DUCKS—Rouen. Drake.

1st. No. 507. John Gillies, Edington Mills, Chirnside.
2nd. No. 506. John Gillies, Edington Mills, Chirnside.
C. No. 508. William Linton, Sloethornbank, Selkirk.

Class 72. DUCKS—Rouen. Duck.

1st. No. 509. John Gillies, Edington Mills, Chirnside.
2nd. No. 510. John Gillies, Edington Mills, Chirnside.
C. No. 511. William Linton, Sloethornbank, Selkirk.

Class 73. DUCKS—Any other Variety. Drake.

1st. No 512. S. Dalgleish, Blackburn, Chirnside, Berwickshire (Pekin).
2nd. No. 513. Dickson Brothers, Mouswald, Ruthwell (White Pekin).
V. No. 515. Lady Wilson, Chillingham Barns, Belford, Northumberland (Cayuga).

Class 74. DUCKS—Any other Variety. Duck.

1st. No. 516. S. Dalgleish, Blackburn, Chirnside, Berwickshire (Pekin).

Class 75. DUCKS—Any Breed (Aylesbury excepted). Drake (Young).

1st. No. 519. John Gillies, Edington Mills, Chirnside (Rouen).
2nd. No. 520. John Gillies, Edington Mills, Chirnside (Rouen).

Class 76. DUCKS—Any Breed (Aylesbury excepted). Duck (Young).

1st. No. 521. John Gillies, Edington Mills, Chirnside (Rouen).
2nd. No. 522. John Gillies, Edington Mills, Chirnside (Rouen).

Class 77. GEESE. Gander.

1st. No. 524. James Dow, Clathybeg, Auchterarder (Embden).
2nd. No. 526. John Pringle, Branton, Glanton, R S.O., Northumberland (Toulouse).
3rd. No. 527. John Pringle, Branton, Glanton, R.S.O., Northumberland (Toulouse).
V. No. 523. James Dow, Clathybeg, Auchterarder (Embden).
H. No. 528. Miss Shanks, Cuthelton Farm, Denny (Toulouse).
C. No. 525. John Page, Dunblane (Embden).

Class 78. GEESE. Goose.

1st. No. 531. James Dow, Clathybeg, Auchterarder (Embden).
2nd. No. 532. James Dow, Clathybeg, Auchterarder (Embden).
3rd. No. 530. James Dow, Clathybeg, Auchterarder (Embden).
H. No. 533. John Page, Dunblane (Embden).
C. No. 534. Miss Shanks, Cuthelton Farm, Denny (Toulouse).

Class 79. TURKEYS. Cock.

1st. No. 540. John Page, Dunblane (American Bronze).
2nd. No. 538. G. Hart, Ardencaple Castle, Helensburgh (American Bronze).
3rd. No. 537. Robert Clark, Taybank, Errol (American Bronze).
H. No. 542. Miss Shanks, Cuthelton Farm, Denny (Bronze).
H. No. 543. Lady Wilson, Chillingham Barns, Belford, Northumberland (Bronze).
C. No. 541. Lord Polwarth, Humbie, Upper Keith.

Class 80. TURKEYS. Hen.

1st. No. 545. George A. Bell, Lundin Mill Farm, Largo (American Bronze).
2nd. No. 549. Miss Shanks, Cuthelton Farm, Denny (Bronze).
3rd. No. 550. Miss Shanks, Cuthelton Farm, Denny (Bronze).
V. No. 547. G. Hart, Ardencaple Castle, Helensburgh (American Bronze).
H. No. 546. George A. Bell, Lundin Mill Farm, Largo (American Bronze).
C. No. 551. Lady Wilson, Chillingham Barns, Belford, Northumberland (Bronze).

DAIRY PRODUCE

CLASS 1. CURED BUTTER, not less than 7 lb.—Premiums, £4, £2, and £1.

1st.	No. 5.	Robert Gilmour, Stonebyres, Eaglesham.
2nd.	No. 2.	Miss Mary Dalrymple, Elliston, St Boswells.
3rd.	No. 9.	William Paterson, Barnego, Denny.
V.	No. 1.	Robert Chalmers, Duntilland, Holytown.
H.	No. 8.	Henry Orr, Torrance, Blackridge, Westcraigs.
C.	No. 7.	Colonel Murray of Polmaise, Stirling.

CLASS 2. POWDERED BUTTER, not less than 7 lb.—Premiums, £4, £2, and £1.

1st.	No. 15.	Robert Gilmour, Stonebyres, Eaglesham.
2nd.	No. 20.	Henry Orr, Torrance, Blackridge, Westcraigs.
3rd.	No. 12.	Miss Mary Dalrymple, Elliston, St Boswells.
V.	No. 21.	William Paterson, Barnego, Denny.
H.	No. 11.	Robert Chalmers, Duntilland, Holytown.
C.	No. 18.	Colonel Murray of Polmaise, Stirling.

CLASS 3. FRESH BUTTER, Three 1-lb. Rolls.—Premiums, £4, £2, and £1.

1st.	No. 43.	William Paterson, Barnego, Denny.
2nd.	No. 28.	Miss Mary Dalrymple, Elliston, St Boswells.
3rd.	No. 40.	Colonel Murray of Polmaise, Stirling.
V.	No. 44.	William Rennie, Parkhead, Slamannan.
H.	No. 41.	Thomas Nimmo, Lawhead, Forth, Lanark.
C.	No. 42.	Henry Orr, Torrance, Blackridge, Westcraigs.

BUTTER-MAKING COMPETITIONS

CLASS 1.—Premiums of £5, £4, £3, £2, and £1. Open to all comers.

THE PRINCE OF WALES SILVER MEDAL accompanies First Prize.

1. Mary Speir, Newton Farm, Newton, Glasgow.
2. Jeanie Carruthers, Netherton, Auchenheath, by Hamilton.
3. M. W. Crawford, Figgitoch, Cumbrae, Millport.
4. Margaret A. Simpson, 53 Woodstock Street, Kilmarnock.
5. Nellie M. Smith, 7 Shandon Street, Edinburgh.

H. Millie Dods, Lugton House, Dalkeith.
H. Maggie Farquharson, Lonely Bield, Penicuik.
C. Agnes Kinross, Wester Balbeggie, Kirkcaldy.
C. Ella Street, 58 Dundonald Road, Kilmarnock.
C. Agnes Watson, Dalkeith Park, Dalkeith.

CLASS 2.—Premiums of £3, £2, and £1. The Prizes for this Class are given by the Technical Education Committee of the Mid-Lothian County Council. Confined to pupils of Miss Ridley, Dairy Instructress to the County Council of Mid-Lothian, who have not obtained a Prize at any former Competition.

THE PRINCE OF WALES SILVER MEDAL accompanies First Prize.

1. Susan Cunisky, Bavelaw Castle, Balerno.
2. Annetta H. Smith, 1 Grassmarket, Edinburgh.
3. Mina Hamilton, Tower Cottage, Liberton.

H. Jessie Campbell, Goodtrees, Balerno.
H. Mary Pringle, Temple Farm, Gorebridge.
C. Maggie Buchanan, Roslinlee Dairy, Roslin.
C. Rachel Wilson, Carrington Mains, Gorebridge.

CLASS 3.—Premiums, £3, £2, and £1. The Prizes for this Class are given by the Technical Education Committee of the Mid-Lothian County Council. Confined to pupils of Miss Ridley, Dairy Instructress to the County Council of Mid-Lothian, who have received Certificates and won Prizes at former Competitions. Prize-takers in Class 2 eligible to compete in Class 3.

THE PRINCE OF WALES SILVER MEDAL accompanies First Prize.

1. Maggie Farquharson, Lonely Bield, Penicuik.
2. Annie E. M. Mitchell, Southfield, Liberton.
3. Maggie Hamilton, 26 Montrose Terrace, Edinburgh.
H. Millie Dods, Lugton House, Dalkeith.
H. Annetta H. Smith, 1 Grassmarket, Edinburgh.
H. B. Smith, Firth Mains, Roslin.
C. Gracie Dods, Polton Farm, Lasswade.
C. Susan Cumisky, Bavelaw Castle, Balerno.

CLASS 4. (Consolation).—Premiums, £3, £2, and £1.

1. G. A. Girvan, Gogar Green Dairy, Corstorphine.
2. Mary Dalrymple, Elliston, St Boswells.
3. Gracie Dods, Polton Farm, Lasswade.
H. Jean Inch, Carrington Mains, Gorebridge.
C. Violet N. Foulis, House o' Muir, Milton Bridge, Glencorse.
C. Georgina Kennedy, West Heddon, Wylam-on-Tyne.

JUDGES

Shorthorn. — John Cran, Kirkton, Bunchrew, Inverness; Robert Wright, Nocton Heath, Lincoln.

Aberdeen-Angus. — Robert Bruce, Royal Dublin Society, Leinster House, Dublin; Samuel Davidson, Beech Hill, Inverness.

Galloway.—John M'Turk, Bellrigg, Castle-Douglas; Robert Shennan, Balig, Kirkcudbright.

Highland. — Duncan M'Diarmid, Camusericht, Rannoch Station; John M'Gillivray, Ballachroan, Kingussie.

Ayrshire.—George Alston, Loudoun Hill, Darvel; Robert Paton, Trees, Ayr.

Jersey. — Sir James Blyth, Bart., Blythwood, Stansted, Essex.

Stallions, Entire Colts, and Draught Geldings.—William Hood, Chapelton, Kirkcudbright; James F. Murdoch, East Hallside, Newton.

Mares and Fillies.—James Weir, Sandilands, Lanark; William Clark, Netherlea, Cathcart.

Hunters. — Charles J. Cunningham, Wooden, Kelso; Rev. Cecil Legard, Cottesbrooke Rectory, Northampton.

Hackneys. — R. G. Heaton, Ferry Hill, Chatteris, Cams.

Roadsters and Ponies.—W. Bainbridge, Hillside, Lancaster.

Shetland Ponies.—John J. R. Meiklejohn, Novar, Evanton.

Blackfaced.—Peter M'Intyre, Tighnablair, Comrie; James Moffat, Gateside, Sanquhar; William Sloan, Maneight, New Cumnock.

Cheviot.—John Millar, of Scrabster, Thurso; H. Thompson, Cleugh Brae, Otterburn.

Border Leicester.—W. S. Ferguson, Pictstonhill, Perth; Joseph Lee, Markle, Prestonkirk.

Half-Bred.—J. S. Johnston, Crailing Hall, Jedburgh; John Mark, Sunnyside, Prestonkirk.

Shropshire.—T. S. Minton, Montford, Shrewsbury.

Oxford Down. — A. F. M. Druce, Bladon, Woodstock.

Suffolk.—S. W. Slater, Cheveley Hall, Newmarket.

Fat Sheep.—James Wood, 103 Nicolson Street, Edinburgh.

Swine. — T. S. Minton, Montford, Shrewsbury.

Poultry. — John Meikle, Mount Hamilton, Ayr.

Butter. — William Smith, 1 Grassmarket, Edinburgh.

Wool. — Alexander Macnaughton, manufacturer, Pitlochry.

ATTENDING MEMBERS

Shorthorn.—Robert Paterson, Alex. Guild, J. T. Mungle.

Aberdeen-Angus. — A. M. Gordon, C. M. Cameron, James Shields.

Galloway. — William Ford, Alex. Glendinning.

Highland.—Sir Robert Menzies, Sir Archibald Buchan Hepburn, Thomas Elder.

Ayrshire.—Colonel R. F. Dudgeon, David Allison, Judge Gulland.

Jersey.—W. T. Malcolm, Sir James H. W. Drummond, Bart.

Stallions, Entire Colts, and Draught Geldings.—Captain Clayhills Henderson, George Dun, E. Hedley Smith, James S. Dickson, William Gillespie.

Mares and Fillies.—J. M. Martin, Gavin Jack, John M'Caig, T. M. Skirving, Thomas Blair, Treasurer M'Crae.

Hunters. — Sir Ralph Anstruther, Alex. Cross, James Hope, Henry Callander, A. Alexander.

Hackneys. — David Wilson, John M'Millan, A. A. Ralston, Alexander Dudgeon.

Roadsters and Ponies.—C. H. Scott Plummer, James I. Davidson, James Wylie, Councillor Cranston.

Shetland Ponies.—W. H. Lumsden, Captain Stewart, Bailie Brand.

Blackfaced.—John Speir, John Marr, John Edgar.

Cheviot.—Master of Polwarth, James Stenhouse.

Border Leicester. — John Wilson, Wellwood Maxwell.

Half-Bred.—R. Shirra Gibb, Major-General Wauchope, Bailie Mackenzie.

Shropshire.—John Scott Dudgeon.

Oxford Down. — James Lockhart, Bailie Kinloch Anderson.

Suffolk.—Sir Robert D. Moncreiffe, Bailie Robertson.

Fat Sheep.—Andrew Hutcheson.

Swine.—R. B. Macdonald, Granton Mains, Edinburgh.

Poultry.—Bailie Sloan.

Butter.—John Macpherson Grant.

Butter-making Competitions. — Col. Wardlaw Ramsay, Master of Polwarth (Wednesday), R. Shirra Gibb (Thursday).

Wool. — William Duthie, Bailie Pollard.

DISTRICT COMPETITIONS.

15	Districts—Grants of £12 each (Section I.)	£180	0	0
"	Grants of £15 each (Section II.)	135	0	0
5	Special Grants	31	0	0
34	Medals for Shows	47	16	3
20	Medals for Cottages and Gardens	8	4	4
205	Medals for Ploughing	49	10	10
288		£451	11	5

VETERINARY DEPARTMENT.

38 Silver Medals	£24	4	6

AGRICULTURAL CLASS, EDINBURGH UNIVERSITY.

4 Prizes of £2, 10s. each	£10	0	0

ABSTRACT OF PREMIUMS.

Edinburgh Show	£3669	17	4
District Competitions	451	11	5
Veterinary Colleges	24	4	6
Agricultural Class, Edinburgh University	10	0	0
Medal to Professor Cossar Ewart	7	10	0
	£4163	3	3

STATE OF THE FUNDS

OF

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND

As at 30th NOVEMBER 1899.

I. HERITABLE BONDS—						
£11,000 at 3¾ per cent, £500 at 3½ per cent, £14,000 at 3¼ per cent, £9000 at 3 per cent				£34,500	0	0
II. DEBENTURE STOCKS—						
£4,250 N.B. Railway Co. 3 per cent, at 101½	£4,313	15	0			
£2,727 Caled. Railway Co. 4 per cent, at 136½	3,722	7	1			
£1,334 London and North-Western Railway Company 3 per cent, at 108¼ . .	1,444	1	1			
£1,212 Mid. Railway Co. 2½ per cent, at 91 .	1,102	18	4			
£1,036 N.E Railway Co. 3 per cent, at 107½ .	1,113	14	0			
£1,026 Gt. N. Railway Co. 3 per cent, at 107½	1,102	19	0			
£1,013 London and South-Western Railway Company 3 per cent, at 108⅜ . .	1,097	16	9			
				13,897	11	3
III. BANK STOCKS—						
£6,407 7 8 Royal Bank of Scotland, at 235½	£15,089	7	9			
2,218 16 5 Bank of England, at 338 .	7,499	12	3			
2,500 0 0 British Linen Co. Bank, at 490 .	12,250	0	0			
2,341 13 4 Bank of Scotland, at 348 .	8,149	0	0			
£13,467 17 5				42,988	0	0
IV. ESTIMATED VALUE of Building, No. 3 George IV. Bridge .				3,100	0	0
V. ESTIMATED VALUE of Furniture, Paintings, Books, &c. . .				1,000	0	0
VI. ARREARS OF MEMBERS' SUBSCRIPTIONS considered recoverable				68	2	0
VII. BALANCE DUE BY ROYAL BANK OF SCOTLAND ON ACCOUNTS CURRENT, at 30th November 1899				1,989	13	9
AMOUNT OF GENERAL FUNDS . .				£97,543	7	0
VIII. TWEEDDALE MEDAL FUND—						
Heritable Bond, at 3½ per cent				£500	0	0
IX. THE ROBERT MURDOCH PRIZE FUND—						
Legacy by the late Miss Murdoch, Blantyre, to be applied in giving a prize of £10 a-year, while it lasts, to the Breeder of the best Clydesdale Brood Mare at the Annual Show of the Society, £100, less duty				£90	0	0
Interest on Deposit Receipt, dated 9th January, and uplifted 13th July 1899				0	14	5
				£90	14	5
Transferred to Edinburgh Show Account				10	0	0
On Deposit Receipt with Royal Bank, dated 13th July 1899 .				£80	14	5

JAS. H. GIBSON-CRAIG, *Treasurer.*
GEORGE R. GLENDINNING, *Member of Finance Committee.*
WM. HOME COOK, C.A., *Auditor.*

EDINBURGH, 10*th January* 1900.

ABSTRACT of the ACCOUNTS of the HIGHLAND and

CHARGE.

1. Balance due by Royal Bank of Scotland at 30th November 1898 .			£1,009 13 11
2. Arrears of Subscriptions outstanding at 30th Nov. 1898		£91 6 0	
Less: Due by Members who have compounded for life, and whose arrears are thereby extinguished . . .	£13 10 6		
Sums ordered to be written off .	38 1 6		
		51 12 0	
			39 14 0
3 Interests and Dividends—			
(1) Interests—			
On Heritable Bonds, less Income-tax .		£1,118 6 3	
On Debenture Stocks, do. . .		267 7 6	
On Deposit Receipts		19 3 8	
		£1,404 17 5	
(2) Dividends on Bank Stocks . . .		1,465 9 2	
			2,870 6 7
4. Subscriptions—			
Annual Subscriptions		£1,009 6 6	
Life Subscriptions		1,367 4 0	
			2,376 10 6
5. Transactions—Sales			15 0 0
6. Receipts from Edinburgh Show			15,610 14 6
7. Miscellaneous Receipts			10 0 0
Sum of Charge . .			£21,931 19 6

Edinburgh, 10*th January* 1900.

AGRICULTURAL SOCIETY of SCOTLAND for the Year 1898-99

DISCHARGE.

1. Establishment Expenses—			
Salaries and Wages			£1,192 0 0
Feu-duty, £28; Taxes, £40, 9s. 4d.			68 9 4
Coals and Gas			22 17 4
Insurances			16 14 8
Repairs and Furnishings—Special, £51, 3s. 5d.; Ordinary, £28, 17s. 10d.			80 1 3
			£1,380 2 7
2. Fee to Auditor of Accounts for 1897-98			50 0 0
3. Education—			
(1) Forestry—Vote to Chair in Edinburgh University		£50 0 0	
(2) Agriculture—Prizes to Agricultural Class in Edinburgh University, £10; Fees to Examiners, Travelling Expenses, Refreshments, &c., £50; Expenses of Deputations to London, £82, 17s. 8d.	£142 17 8		
Less—Forfeited entry fees,	18 0 0		
		124 17 8	
			174 17 8
4. Chemical Department—			
(1) Salary to Chemist		£50 0 0	
(2) Chemists' Fees and Expenses—Fees for Analyses for Members, £80, 5s.; Do. in connection with Experiments, &c., £76, 7s.		156 12 0	
(3) Expenses visiting Experiments at Edrom		14 18 11	
(4) Manures for Experiments		42 10 1	
(5) Expenses of Sheep Feeding Experiments		49 3 9	
			313 4 9
5. Veterinary Department—Principal Williams, £26, 5s.; Medals, £24, 4s. 6d.			50 9 6
6. Botanical Department—Fee to Botanist for year			25 0 0
7. Dairy Department—			
(1) Examinations—Fees to Examiners, £25, 4s.; Travelling Expenses, £4, 14s. 6d.; Hotel Bill, £10, 10s. 6d.; Advertising, £1, 0s. 7d.; Assistants, £11, 4s.; Miscellaneous, £10, 1s. 6d.	£62 15 1		
Less—Forfeited entry fees	4 0 0		
		£58 15 1	
(2) Special Grants—Vote to Scottish Dairy Institute for 1899, £60; Grant to Stewartry Dairy Association, £35,		95 0 0	
			153 15 1
8. Transactions			614 11 7
9. Ordinary Printing, £64, 11s. 7d.; Advertising, £15, 10s. 2d.; Stationery, &c., £59, 13s. 3d.; Postages, £87; Bank Charges, &c., £8, 4s. 0d.			234 19 0
10. Grants to Public Societies—Scottish Meteorological Society, £20; Highland Association (Mòd), £10, 10s.: Society for Prevention of Cruelty to Animals, £5			35 10 0
11. Miscellaneous Expenses—Secretary, attending Meetings for Nomination of Directors, £21, 8s. 6d.; Do. attending Shows, &c., £25, 10s. 6d.; Reporting Board Meetings, £21; Luncheons to Directors, £19, 9s. 8d.; Prof. Cossar Ewart, Large Gold Medal, £7, 10s.; Sundries, £12, 12s. 6d.			107 19 0
12. Investments made			4,524 8 4
13. Payment in connection with Glasgow Show			1 10 0
14. Payments in connection with Dumfries Show—Premiums			20 0 0
15. Payments in connection with Kelso Show—Premiums			177 0 0
16. Edinburgh Show—Premiums, £3,512, 17s. 4d.; Expenses, as per p. 455, £8,054, 17s.			11,567 14 4
17. Premiums for District Competitions			305 16 4
18. Premiums for Cottages and Gardens			11 2 4
19. Arrears struck off as irrecoverable			36 2 0
20. Arrears outstanding at 30th November 1899			68 2 0
21. Balance due by Royal Bank on Accounts Current at 30th November 1899			1,989 13 9
Sum of Discharge			£21,931 19 6

JAS. H. GIBSON-CRAIG, *Treasurer.*
GEORGE R. GLENDINNING, *Member of Finance Committee.*
WM. HOME COOK, C.A., *Auditor.*

ABSTRACT of the ACCOUNTS

CHARGE.

1. LOCAL SUBSCRIPTIONS—		
Voluntary Assessment, Edinburghshire		£417 17 1
" " Haddingtonshire		240 12 9
Subscriptions collected in Linlithgowshire		34 4 11
Donation by the City of Edinburgh		420 0 0
		£1,112 14 9
2. AMOUNT COLLECTED DURING SHOW—		
Drawn at Gates	£8,047 6 11	
Drawn at Grand Stand	1,642 13 9	
Catalogues and Awards sold	532 10 4	
Lavatories and Cloak-Rooms	8 12 2	
		10,231 3 2
3. FORAGE SOLD		14 8 9
4. ADMISSION TO BUTTER-MAKING COMPETITIONS AND BUTTER SOLD		23 10 6
5. DRAWN AT ROYAL PAVILION		20 4 0
6. RENT OF STALLS		2,824 17 0
7. RENT OF REFRESHMENT BOOTHS		345 0 0
8. ADVERTISING IN CATALOGUE AND PREMIUM LIST		230 0 0
9. SPECIAL PRIZES CONTRIBUTED		744 15 0
10. INCOME FROM TWEEDDALE MEDAL FUND		16 18 4
11. DRAWN AT TRIAL OF MANURE DISTRIBUTORS		1 19 6
12. INTEREST FROM ROYAL BANK		45 3 6
		£15,610 11 6

Note.—From the above balance of	£4,043 0 2
There has to be deducted the premiums undrawn at 30th November, amounting to	132 0 0
Making the probable Surplus	£3,911 0 2

10*th January* 1900.

of the EDINBURGH SHOW, 1899.

DISCHARGE.

1. Showyard Expenditure—		
Fitting up Showyard		£4,127 4 4
Show Ground, Rent, Preparation and Restoration of Ground, Removing and Restoring Fences		572 19 11
Water Pipes, £22, 4s. 6d.; Telegraph Wires, £12, 2s. 8d.		34 7 2
Flags, Furnishings, &c., £43, 7s. 9d.; Indicators, £9, 6s.; Rosettes, £31, 6s. 3d.		84 0 0
Miscellaneous		23 13 0
		£4,842 4 5
2. Forage		410 19 8
3. Police		131 4 0
4. Travelling Expenses of Judges, Stewards, &c.		132 7 11
5. Hotel and Luncheons—		
Hotel Bill for 29 Directors, 7 Stewards, 30 Judges, &c.	£173 6 1	
Luncheons in Showyard for Judges, Directors, Attending Members, and Members of Committee, and Breakfasts for Stewards, Assistants, &c.	146 1 9	
		319 7 10
6. Music		97 12 0
7. Printing		454 1 9
8. Advertising and Bill-posting		162 2 10
9. Highland Industries		7 6 6
10. Butter-making Competitions		137 5 9
11. Veterinary Inspection		10 10 0
12. Outlays in connection with visit of Prince of Wales		579 17 6
13. Donations to Royal Infirmary and Scottish Agricultural Institution, being amount drawn at Royal Pavilion		20 4 0
14. Trials of Oil Engines and Manure Distributors		90 5 11
15. Concert for Attendants		0 15 0
16. Assistants and Attendants		218 7 6
17. Postages		68 0 0
18. Miscellaneous		42 4 5
19. Honoraria to Staff		330 0 0
Amount of General Expenditure		£8,054 17 0
20. Premiums drawn at 30th November		3,512 17 4
		£11,567 14 4
Balance of Receipts		4,043 0 2
		£15,610 14 6

JAS. H. GIBSON-CRAIG, *Treasurer.*
GEORGE R. GLENDINNING, *Member of Finance Committee.*
WM. HOME COOK, C.A., *Auditor.*

ABSTRACT of the ACCOUNTS of the

CHARGE.

I. Funds as at 30th November 1898—			
£3,193, 6s. 8d. 3 per cent Debenture Stock of the North British Railway Company, purchased at			£2,650 0 0
£3,000 Funded Debt of the Clyde Navigation Trustees, purchased at			2,970 0 0
£405 Royal Bank of Scotland Stock, purchased at . .			893 14 6
			£6,513 14 6
Balances in Royal Bank—			
On Deposit Receipt, dated 3rd February 1898		£100 0 0	
On Current Account		244 9 7	
			344 9 7
			£6,858 4 1
II. Investments realised—			
Price of £3,000 Clyde Navigation Trustees 4 per cent Funded Debt, at 107½, ex. div., *less* Brokerage and Expenses		£3,192 16 6	
Price of £405 Royal Bank of Scotland Stock, at 230½, *less* Brokerage		928 17 6	
		£4,121 14 0	
III. Profit on Realisation of Investments—			
Price of £3,000 Funded Debt of the Clyde Navigation Trustees, *less* Brokerage and Expenses		£3,192 16 6	
Less—Value as in Branch I. . .		2,970 0 0	
		£222 16 6	
Price of £405 Royal Bank of Scotland Stock, *less* Brokerage and Expenses . .	£928 17 6		
Less—Value as in Branch I.	893 14 6		
		35 3 0	
			257 19 6
IV. Income—			
Interest on Investments—			
On £3,193, 6s. 8d. 3 per cent Debenture Stock of the North British Railway Company, £95, 16s., tax £3, 3s. 10d. . .		£92 12 2	
On £3,000 Funded Debt of the Clyde Navigation Trustees at 4 per cent, for half-year to Whitsunday 1899, £60, tax £2 .		58 0 0	
On £3,500 on loan, Heritable Bond, at 3 per cent, for half-year to Martinmas 1899, £52, 10s., tax £1, 15s.		50 15 0	
On £405 Royal Bank of Scotland Stock, for half-year to 14th October 1899 . .		16 4 0	
			217 11 2
Sum of Charge . . .			£7,333 14 9

10*th January* 1900.

ARGYLL NAVAL FUND for Year 1898-99.

DISCHARGE.

I. ALLOWANCE to the five following Recipients—			
Edward L. Grieve (fifth year)			£40 0 0
Percy L. H. Noble (fifth year)			40 0 0
Malcolm H. S. Macdonald (second year)			40 0 0
James Douglas Campbell (first year)			40 0 0
John Stewart Gordon Fraser (first year) . . .			40 0 0
			£200 0 0
II. EXPENSES—			
William Blackwood & Sons, Printing Forms of Application .			0 11 6
			£200 11 6
III. INVESTMENTS made—			
Amount in loan on Heritable Bond, at 3 per cent		£3,500 0 0	
Paid price of £550 Lancashire and Yorkshire Railway Company 3 per cent Debenture Stock, at 110, and Brokerage and Stamps .		611 10 6	
		£4,111 10 6	
IV. FUNDS as at 30th November 1899—			
£3,193, 6s. 8d. 3 per cent Debenture Stock of the North British Railway Company, purchased at		£2,650 0 0	
Amount in loan on Heritable Bond, at 3 per cent		3,500 0 0	
£550 Lancashire and Yorkshire Railway Company 3 per cent Debenture Stock, purchased at		611 10 6	
		£6,761 10 6	
Balances in Royal Bank—			
On Deposit Receipt, dated 3rd February 1898 . .	£100 0 0		
On Current Account . .	271 12 9		
		371 12 9	
			7,133 3 3
SUM OF DISCHARGE . .			£7,333 14 9

JAS. H. GIBSON-CRAIG, *Treasurer.*
GEORGE R. GLENDINNING, *Member of Finance Committee.*
WM. HOME COOK, C.A., *Auditor.*

VIEW OF RECEIPTS AND PAYMENTS
For the Year 1898-99.

RECEIPTS.

1. ANNUAL SUBSCRIPTIONS AND ARREARS received . . .		£944 16 6
2. LIFE SUBSCRIPTIONS		1,367 4 0
		£2,312 0 6
3. INTERESTS AND DIVIDENDS—		
Interests	£1,404 17 5	
Dividends	1,465 9 2	
		2,870 6 7
4. TRANSACTIONS		15 0 0
5. RECEIPTS from Edinburgh Show		15,610 14 6
6. MISCELLANEOUS RECEIPTS		10 0 0
SUM OF RECEIPTS . .		£20,818 1 7

PAYMENTS.

1. ESTABLISHMENT EXPENSES—			
Salaries and Wages		£1,192 0 0	
Feu-duty, Taxes, Coals, Gas, Insurances, Repairs, and Furnishings . . .		188 2 7	
		£1,380 2 7	
2. FEE TO AUDITOR of Accounts for 1897-98 . .		50 0 0	
3. EDUCATION		174 17 8	
4. CHEMICAL DEPARTMENT		313 4 9	
5. VETERINARY DEPARTMENT		50 9 6	
6. BOTANICAL DEPARTMENT		25 0 0	
7. DAIRY DEPARTMENT		153 15 1	
8. TRANSACTIONS		614 11 7	
9. ORDINARY Printing, Advertising, Stationery, Postages, Bank Charges, &c.		234 19 6	
10. GRANTS to Public Societies		35 10 0	
11. MISCELLANEOUS		107 19 9	
12. PAYMENTS in connection with Glasgow Show .		1 10 0	
13. PAYMENTS in connection with Dumfries Show .		20 0 0	
14. PAYMENTS in connection with Kelso Show . .		177 0 0	
15. PAYMENTS in connection with Edinburgh Show—			
Premiums . . .	£3,512 17 4		
General Expenses . .	8,054 17 0		
		11,567 14 4	
16. PREMIUMS for District Competitions . .		395 16 4	
17. PREMIUMS for Cottages and Gardens . .		11 2 4	
SUM OF PAYMENTS .			15,313 13 5
BALANCE OF RECEIPTS . .			£5,504 8 2

JAS. H. GIBSON-CRAIG, *Treasurer.*
GEORGE R. GLENDINNING, *Member of Finance Committee.*
WM. HOME COOK, C.A., *Auditor.*

EDINBURGH, 10*th January* 1900.

PROCEEDINGS AT BOARD MEETINGS.

MEETING OF DIRECTORS, 1st FEBRUARY 1899.

Present.—Ordinary Directors—Mr Charles Howatson of Glenbuck; Mr Robert Paterson, Hill of Drip; Mr John Marr, Cairnbrogie; Mr John Cran, Kirkton; Mr C. H. Scott Plummer of Sunderland Hall; Mr John Speir, Newton Farm; Mr George Dun, Easter Kincaple; Mr John M'Hutchen Dobbie, Campend; Mr W. H. Lumsden of Balmedie; Mr John Macpherson Grant, yr. of Ballindalloch; Mr Walter Elliot, Hollybush; Mr Alex. Cross of Knockdon; Mr W. T. Malcolm, Dunmore Home Farm; Captain Robert Dundas, yr. of Arniston; Mr John M'Caig, Challoch; Mr Jonathan Middleton, Clay of Allan; Mr E. Hedley Smith, B.L., Whittinghame; Mr Wm. Clark, Netherlea; Mr R. Shirra Gibb, Boon; Mr R. W. B. Jardine, yr. of Castlemilk. *Extraordinary Directors*—Sir Archibald Buchan Hepburn of Smeaton, Bart.; Mr James Hope, East Barns; Mr George R. Glendinning, Hatton Mains; Sir Robert Menzies of Menzies, Bart.; Mr C. M. Cameron, Balnakyle; Mr James Lockhart, Mains of Airies; Mr John M. Martin, Edinburgh; Mr Andrew Hutcheson, Beechwood; Mr John Wilson, Chapelhill. *Treasurer*—Sir James H. Gibson-Craig of Riccarton, Bart. *Hon. Secretary*—Sir John Gilmour of Montrave, Bart. *Chemist*—Dr A. P. Aitken. *Veterinary Surgeon*—Principal Williams. Sir John Gilmour of Montrave, Bart., in the chair.

Minutes of the preceding meeting of Directors on 18th January, and of the annual General Meeting on same day, were read and approved.

Edinburgh Show.

Special Prizes.—The Secretary intimated several donations of special prizes. Sir James Gibson-Craig submitted an elaborate and liberal prize-list offered for Hunters by various gentlemen. He mentioned that the Messrs Usher, in one form or other, had contributed something like £80. The name of Usher was, in that part of the country at least, synonymous with liberality. The Mid-Lothian County Club were also entitled to special mention, as it was the first time that a county club had come forward in its capacity as such to assist the Society. He also wished to acknowledge specially the efforts of Mr Johnstone Douglas, Comlongan Castle, Dumfries, and Mr Wylie, secretary of the Edinburgh Agricultural Society, in collecting the money which he now offered. Altogether he had collected £427, and in the saddle classes there was offered £499 in prize money—the total amount for the hunting horses at the Edinburgh Show of 1899 being £610, with medals in addition.

The Chairman said they owed a very special vote of thanks to Sir James Gibson-Craig for going into the matter with so much enthusiasm. The liberality of their prize-list ought to bring out the best show of Hunters ever held in Scotland.

On the motion of the Chairman, a special vote of thanks was passed to the donors who had subscribed to the prizes now announced.

The arrangements made by the Committee for the butter-making competitions were intimated.

Premium List.—On the motion of Mr Martin, the Prince of Wales's medal for the best Roadster was extended to include the best animal in the harness class also.

The SECRETARY asked for a ruling of the Board as to the interpretation of the new regulation regarding brood mares with foal at foot. That regulation is that the mare must have at foot a foal which she is suckling. The question had been asked whether an exhibitor would be at liberty to show a mare having at foot a foal which was not her own while her own foal was alive. After prolonged discussion, in which several of the members took part, it was agreed that a mare should not be allowed to compete in the brood mare class with a foster-foal at foot unless her own foal were dead.

CLIPPING REGULATIONS.

The Board proceeded to discuss the following motion adopted at the anniversary general meeting on the 18th January: "That the matter of regulations for the clipping of sheep to be exhibited at the shows of the Society be remitted to the Directors for reconsideration."

Before the discussion was entered into, Mr HOWATSON asked on whose initiative the Board had taken up consideration of this question at the December meeting.

The SECRETARY said that on the 23rd November, the day preceding the issue of the notices for the December meeting, he received a printed letter from the National Sheep-Breeders' Association, which had been sent, he understood, to all other societies, with the request that it should be brought before the Board. He put it on the agenda in the usual course.

A letter was also read from Mr Millar of Lambhill, Strathaven, dated 20th January, asking the Board to bear in mind, when they came to consider the motion passed at the anniversary general meeting, that certain exhibitors, and himself amongst them, had made arrangements to show their sheep under the regulations passed on the 1st December, and he begged that no further alterations should take place in the regulations for this year.

A letter was also read from Mr W. S. Ferguson, who was unable to be present, having to be in London. He did not consider the motion of which Mr Howatson had given notice sufficient to meet the difficulty which had arisen. A year's notice ought to be given before any regulations for the Show could be altered. There should be no necessity for treating Blackface sheep different from any other breed, and in his opinion it was the judges and exhibitors who laid down the conditions under which stock should be exhibited and judged. On the other hand, it was absurd for the directors to lay down rules that they had no means of adhering to.

Mr JOHN M. MARTIN was glad that the notice from the National Sheep-Breeders' Association had been read, as it showed how this question had come before them. He supposed most of them were prepared to admit that the decision arrived at at the December meeting was somewhat hasty, and if they admitted that, the next thing for them to do was to consider how they should retrace their steps—not so much with due regard to their own dignity, which, after all, was a subordinate matter, but with advantage to those who bred and exhibited Blackface sheep. At the anniversary meeting he did not think that it would be possible to make any alteration on what had been settled at the December meeting for the ensuing year. He then thought that if further alterations were made it would not be fair to every one; but since then, further discussion had taken place amongst breeders of Blackface sheep, and it had been suggested that the Directors should reinstate the rule which they had then abolished, and, to meet the case of those who had acted on it, antedate its operation one month. He therefore moved that the Board resolve to reinsert Regulation 46, which had been suspended at the December meeting, and substitute in the rule the date, 1st December 1898, for 1st January 1899.

Mr JAMES LOCKHART seconded.

Sir ROBERT MENZIES wished to enter his protest against the whole course which the Directors had taken in this matter. There could be no doubt that Providence had made quite other arrangements for clipping of Blackface sheep from those which were authorised by that Society. Sheep were generally clipped about mid-summer, which was the most seasonable time at which to strip them of their coat. The result of the present system of clipping sheep in mid-winter was to render them weak in constitution, and liable to all kinds of diseases, which they perpetuated in their stock. He did not think the present system was conducive to the prosperity of flockmasters.

Mr Martin's motion was then agreed to, Sir Robert dissenting.

Mr CHARLES HOWATSON then moved as follows, viz.: "That with the object of affording breeders and exhibitors of Blackface sheep an opportunity of representing their views to the Directors regarding the clipping of sheep to be shown at future Shows of the Society, a conference be arranged between a committee of the Board and a committee of breeders. That the Board appoint five of its members as its representatives at that conference. That the Secretary be instructed to invite the gentlemen, whose letters on the subject were submitted at the meeting of the Board on the 4th January, to appoint a committee of not more than five to represent them at the

conference. That the committee of the Board have power to invite other breeders to attend the conference. That the conference be held at the offices of the Society in the month of October, on a date to be fixed by the Chairman of the Board, and that the Board Committee report on the subject to the Board of Directors."

In speaking to his motion, Mr HOWATSON said if they would agree to support this motion it would be a means of gleaning information which would be of great advantage to the Directors, and would enable them to see what would be the best course to take in the matter. It would show everybody that they were prepared to give even-handed justice all round, and act fairly.

Mr HUTCHESON seconded the motion.

Dr SHIRRA GIBB objected to looking at the question simply as it affected the one breed. They ought to consider the whole question of sheep-clipping, and try and get some regulation that would apply to all sheep, so that the rule would not be altered again. He therefore moved as an amendment that Mr Howatson's motion apply to breeders of all kinds of sheep.

Mr JONATHAN MIDDLETON seconded. He said the question should be opened up in a much more effective way than it had been.

The CHAIRMAN suggested whether it would not be a more practical method of procedure to appoint a small committee to consider the whole question and make recommendation to the Board. This committee might send out a circular to all who had exhibited at their Shows during the past three years and get their opinions.

Mr HOWATSON did not agree that that would be broad enough for his purpose.

Mr WALTER ELLIOT said with regard to other breeds of sheep that last year they had sent inquiries to the breeders of Cheviots and got all the information they wanted, and dealt with the matter as they desired.

Mr SPEIR was in favour of confining the remit to the Blackface breed.

Mr MARTIN thought the opinion of Border Leicester breeders, for example, would not be of much assistance in enabling them to decide what would be best for the Blackface breed. It would be most unfortunate if what the Blackface breeders regarded as best for their breed should be overturned by the vote of other breeders whose breeds would be differently affected. He did not agree that this was a matter for sheep-breeders generally. It was simply a question for exhibitors. He therefore moved that the discussion on Mr Howatson's motion be adjourned to the April meeting, and that in the interim the Secretary be authorised to send out to all exhibitors of Blackface sheep at the Shows of the Society during the past three years a circular asking the following questions: (1) Should there be, or should there not be, any further change in the regulation regarding clipping? (2) In the event of their considering it necessary to make further alterations, what date should be inserted as that on which all exhibits for the Shows must be clipped?

Sir ROBERT MENZIES seconded.

A division was then taken between Mr Martin's motion and Dr Gibb's, when Mr Martin's was carried by 21 votes to 4. On a final division between Mr Martin's motion and Mr Howatson's, Mr Martin's motion was carried by 16 to 7.

STIRLING SHOW.

On the motion of Mr W. T. MALCOLM, seconded by Mr ROBERT PATERSON, the Stirling Show of 1900 was appointed to be held on Tuesday, 17th July, and three following days, and the Secretary was instructed to apply at once to the War Office for the use of the show-ground on the King's Park.

SHOW OF 1901.

Mr JOHN MACPHERSON GRANT moved that the Show of 1901 be held at Inverness.

Mr HOWATSON seconded.

Mr MARR was in favour of considering the question of next year's Show along with that of Aberdeen Show of the following year. Personally, he did not think it made much difference although the two Shows were held in consecutive years, but everybody, he was aware, was not of that opinion. He had strong objections to putting back the Aberdeen Show, which ought to be held in 1902.

It was agreed that the Show of 1901 be held at Inverness, provided satisfactory financial and other arrangements can be made.

TUBERCULOUS CARCASSES.

A letter was read from the Meat Trades Association asking the Board to support the society (1) in securing compensation for meat confiscated on account of its being affected with tuberculosis; and (2) in securing the retention of private slaughter-houses.

It was agreed to remit the matter to a Special Committee for consideration and report. Mr Hutcheson was appointed Convener, and the other members of the Committee are—Dr Gibb, Dr Gillespie, Messrs John Wilson, Robert Paterson, John M'H. Dobbie, John M'Caig, and Principal Williams.

A Committee was appointed to consider the whole question of the medals granted to veterinary colleges.

MEETING OF DIRECTORS, 1st MARCH 1899.

Present.—Ordinary Directors—Sir Ralph Anstruther of Balcaskie, Bart.; Mr Robert Paterson, Hill of Drip; Rev. John Gillespie, LL.D., Mouswald Manse; Mr John Cran, Kirkton; Mr C. H. Scott Plummer of Sunderland Hall; Mr George Dun, Easter Kineaple; Mr John M'Hutchen Dobbie, Campend; Mr John Macpherson Grant, yr. of Ballindalloch; Mr Walter Elliot, Hollybush; Mr Alexander Cross of Knockdon; Mr W. T. Malcolm, Dunmore Home Farm; Mr Jonathan Middleton, Clay of Allan; the Hon. the Master of Polwarth, Humbie House; Mr E. Hedley Smith, B.L., Whittinghame; Mr William Clark, Netherlea Farm; Mr W. S. Ferguson, Pictstonhill; Mr R. Shirra Gibb, Boon; Mr R. W. B. Jardine, yr. of Castlemilk. *Extraordinary Directors*—Bailie Thomas Sloan, Edinburgh; Mr James Hope, East Barns; Mr Gavin Jack, Swanston; Sir Robert Menzies of Menzies, Bart.; Mr John Scott Dudgeon, Longnewton; Mr William Ford, Fentonbarns; Sir Robert D. Moncreiffe of Moncreiffe, Bart.; Mr Andrew Hutcheson, Beechwood; Mr John Wilson, Chapelhill. *Hon. Secretary*—Sir John Gilmour of Montrave, Bart. *Chemist*—Dr A. P. Aitken. *Auditor*—Mr William Home Cook, C.A. *Veterinary Surgeon*—Principal Williams. Sir John Gilmour of Montrave, Bart., in the chair.

The minutes of previous meeting were read and approved.

Blackface Sheep at the Edinburgh Show.

A letter was read from Mr Millar, Lambhill, asking that a class should be opened for Blackface tups of any age not subject to the clipping regulations.

Mr Ferguson, Pictstonhill, said the Directors never contemplated a rough class for Blackface sheep, and the prize-list having been issued, he moved that the matter be now considered as closed. Mr Elliot, Hollybush, seconded the motion, which was agreed to.

Creameries and Dairy Produce.

Sir Robert Menzies raised the question whether creameries were eligible to compete in the classes for dairy produce, and moved that entries from creameries ought to be allowed.

The Secretary said he had always had some doubt as to what the regulations meant in regard to creameries competing in the dairy produce classes. In the past they had been allowed to compete.

Mr Hutcheson, Beechwood, Perth, seconded the motion.

Mr John Macpherson Grant of Ballindalloch moved that creameries should not be eligible to compete.

The amendment was seconded by Sir Robert Moncreiffe.

After some conversation it was resolved that the Society should adhere in this particular department of the show to its present regulations, which assume that competitors in the dairy produce classes must have a farm of their own.

Extermination of Tuberculosis.

Dr Gillespie moved: "That, with the view of assisting in the eliminating of tuberculosis from British herds, it is desirable that a series of experiments should be carried out in this country on lines similar to those conducted in Denmark by Professor Bang; that a committee be appointed to consider and report as to the carrying out of such a series of experiments by this Society; and that the committee be authorised to communicate with the Board of Agriculture with the view of securing their co-operation and assistance in such experiments." In speaking to the resolution, Dr Gillespie said that the subject, in his humble opinion, would be a burning one in the immediate future. It related both to human beings and to cattle, and was a very important question from the cattle-owners' point of view. He would submit no esti-

mate as to its prevalence, but any one who knew the real state of the question must, he thought, admit that it was very prevalent, and foreign customers would shut their doors closer and closer against us unless they had an assurance more or less satisfactory that these animals would stand a certain test. He therefore thought it extremely desirable that the disease should be checked, and that our herds should be got into as healthy a condition as possible. The question naturally arose, What were the best means to get quit of the disease, or, at any rate, to reduce it? He thought he might take it for granted that there was a consensus of opinion that that end would never be brought about by any stamping-out policy, even though compensation were allowed. Sufficient was known to afford the presumption that if proper steps were taken the disease could only be got rid of by breeding it out. The plan which Professor Bang had sketched, and which had been supported by the recent Royal Commission, he entirely approved of. They recommended that the Government should supply free tuberculin and the use of the services of properly qualified veterinary surgeons to use it, with a view to leading stock-owners on their own initiative to proceed on the lines followed by Professor Bang—separating the healthy from the unhealthy as found by the tuberculin test, and gradually breeding up a sound herd. This was an experiment he wished to see carried on in this country. He would like to test the soundness of its conclusions. Personally, he accepted these conclusions, but they could not get the great body of the stock-owners in the country to accept them, which he thought was a great mistake on their part. Such an experiment would form an object-lesson to stock-owners, who knew that they had tuberculosis more or less in their herds, and induce them to act for their own interest. The experiment could be quite easily carried out, and any money spent would be amply repaid by the results brought about.

Mr Alex. Cross seconded, and the resolution was unanimously carried.

The following Committee was appointed, viz.: Sir John Gilmour, Dr Gillespie, Messrs Alex. Cross, A. M. Gordon, Andrew Hutcheson, J. M. Martin, and W. S. Ferguson.

Tuberculous Meat.

The Minutes of Committee of 1st March on the above question were read. The Committee were of opinion that compensation should be paid for the condemned carcasses of animals which were apparently healthy when slaughtered. The Committee also thought that private slaughter-houses should be retained if under proper supervision.

The Minutes were approved of.

Damage to Farm Crops by Rooks.

Mr Scott Dudgeon, in calling attention to the damage done by rooks to farm crops, said he thought it was a question which a national society, such as the Highland, should deal with. He did not require to say much about the evil before such a Board, as there were gentlemen before him that day who had expressed themselves very strongly on the question. Sir John Gilmour had made very careful investigation into the habits of rooks, and had proved to the hilt that instead of their being the farmer's friends they were perhaps his greatest enemies. The enormous damage they were doing, especially to the turnip crop in winter and spring, was difficult to exaggerate, and if a general crusade for a short period of the year (during the nesting season) were made, he had no doubt it would prove effectual. He suggested that a Committee be appointed, with powers, to deal with the matter.

Mr Elliot seconded.

After some discussion the motion was carried, and the following were appointed a Committee—viz.: Messrs Scott Dudgeon, A. Hutcheson, Walter Elliot, Scott Plummer, and the Chairman.

Examination in Agriculture.

The Secretary read the report of a Committee with regard to a conference with the Committee of the Royal Agricultural Society of England as to the institution of an examination, to be conducted jointly by the two national societies, for a National Diploma in Agriculture. The Committee recommended that the proposal be given effect to. The principal features of the new scheme are:—

1. An examination in the science and practice of agriculture held annually by the two societies jointly, at a convenient centre, such as Preston.

2. Candidates who pass the examination will receive the National Diploma in Agriculture—the diploma to be distinguished shortly by the letters "N.D.A." Candidates who obtain a certain high percentage of marks (from 60 to 75 per cent) in each subject will receive the diploma with honours. A gold medal will be

awarded to the candidate in the honours list who obtains the highest total number of marks.

3. A joint Board, elected by the two societies, will appoint examiners, and arrange generally for carrying out the examination.

4. The first joint examination will be held in 1900.

This joint examination will take the place of the examinations in the science and practice of agriculture now held annually by the two societies in London and Edinburgh respectively.

Dr GILLESPIE, in moving the adoption of the report, said that the great object was to get a diploma really of a high standard, and worth having. He would be corroborated when he said that as a committee they had been met in the most frank and cordial manner by the representatives of the Royal Agricultural Society of England.

Mr WALTER ELLIOT seconded, and the report was approved of.

PLOUGHING MATCHES.

The Minutes of meeting of the Council appointed to consider the Ploughing Match Regulations, dated 1st March, was read. The Committee recommended that there be no alteration in Regulation 7, and that from Regulation 8, which dealt with the time limit, there should be omitted the present rule, and one to the following effect substituted—viz.: "Local Committees to fix the time to be allowed for ploughing, and they are recommended that the time be not more than ten hours per imperial acre on light land, and not more than fourteen hours on heavy land."

The report was adopted.

MEETING OF DIRECTORS, 5TH APRIL 1899.

Present.—Ordinary Directors—Mr C. Howatson of Glenbuck; Sir Ralph Anstruther of Balcaskie, Bart.; Rev. John Gillespie, LL.D., Mouswald Manse; Mr John Cran, Kirkton; Mr C. H. Scott Plummer of Sunderland Hall; Mr John Speir, Newton Farm; Mr George Dun, Easter Kincaple; Mr David Wilson of Carbeth; Mr John M'Hutcheon Dobbie, Campend; Mr W. H. Lumsden of Balmedie; Mr R. F. Dudgeon of The Grange; Mr John Macpherson Grant, yr. of Ballindalloch; Mr Walter Elliot, Hollybush; Mr Alex. Cross of Knockdon; Mr John M'Caig, Challoch; Mr Jonathan Middleton, Clay of Allan; Mr E. Hedley Smith, B.L., Whittinghame; Mr William Clark, Netherlee; Mr W. S. Ferguson, Pictstonhill; Mr R. Shirra Gibb, Boon; Mr R. W. B. Jardine, yr. of Castlemilk; Mr A. M. Gordon of Newton. *Extraordinary Directors*—Sir Archibald Buchan Hepburn of Smeaton, Bart.; Mr James Hope, East Barns; Mr George R. Glendinning, Hatton Mains; Mr Gavin Jack, Swanston; Sir Robert Menzies of Menzies, Bart.; Mr John Scott Dudgeon, Longnewton; Mr William Ford, Fentonbarns; Mr John M. Martin, Edinburgh; Mr Andrew Hutcheson, Beechwood; Mr John Wilson, Chapelhill. *Honorary Secretary*—Sir John Gilmour of Montrave, Bart.

EDINBURGH SHOWYARD ARRANGEMENTS

On the motion of the CHAIRMAN, a Committee was appointed to make all the necessary arrangements in connection with the Royal visit to the Edinburgh Show, the Committee to consist of the Chairman of the Board, the Convener of the Local Committee, the Stewards, the Lord Provost of Edinburgh, and Mr J. M. Martin.

INVERNESS SHOW.

The Secretary was authorised to apply to the Inverness Town Council for the use of the public park as a site for the Show of 1901, and to apply to the County Councils of the district for the usual voluntary assessment, and to the town of Inverness for a subscription to the local fund.

EXTERMINATION OF TUBERCULOSIS.

Rev. Dr GILLESPIE moved—"That Mr John Speir be elected a member of the Tuberculosis Committee appointed at last meeting of the Board."

Speaking to the motion, the Rev. Doctor said that the non-inclusion of Mr Speir's

name was an inadvertence. Mr Speir was a member of the Tuberculosis Commission, and was therefore specially qualified to sit on the Committee.

Mr Cross seconded.

Mr Gordon moved a direct negative. He did not think that Mr Speir was one who could bring an unprejudiced mind to bear on the matter, and despite Mr Speir's ability and his scientific knowledge, it was necessary that the Committee should consist of those of unprejudiced minds.

Mr Lumsden seconded.

Mr Speir said he had no intention of going on the Committee, and had already said so to the Secretary. The motion was then withdrawn.

Clipping Regulations.

The Secretary stated that in accordance with the resolution adopted at the meeting of the Board of Directors on 1st February, the following queries were addressed to the exhibitors of Blackface sheep at the last three Shows of the Society—viz.: (1) Should there, or should there not, be any regulations as to the clipping of Blackface sheep to be shown at future Highland Shows? (2) In the event of your considering the continuance of clipping regulations desirable, what date should be stated as that after which all Blackface sheep exhibits must be clipped? Number of exhibitors to whom the queries were sent, 30; number of replies received, 17. *First Query*—All reply in the affirmative. *Second Query*—Sixteen say 1st January of the year of the Show; one (Mr Mitchell, Hazelside) 1st February of the year of the Show. The following are the exhibitors who sent replies—viz.: James Archibald, Overshiels; R. & J. Cadzow, Borland; Duncan Campbell, Elie; John Craig, Innergeldie; L. W. Crawford, Cartington; Quintin Dunlop, Morriston; John Fisher, Auchrioch; Robert Lees, Lagg; James Macfarlane, Elibank; D. M'Gibbon, Ard-na-Craig; Colonel R. C. Mackenzie, Auchnacraig; Messrs Macmillan, Glencrosh; D. T. Martin, Girgenti; William Mitchell, Hazelside; Robert Paterson, Birthwood; William Tod, Glenree; Robert Watson, Culterallers.

Mr Martin gave notice of motion for next meeting to the effect that they return to the regulations in regard to sheep-clipping which had been in force before this year.

Damage to Crops by Rooks.

The Minute of Committee with regard to damage to crops by rooks was read and adopted.

Agricultural College in the West of Scotland.

A letter was read from the Secretary of the Scottish Education Department intimating that a scheme has been adjusted for the establishment of an agricultural college in the West of Scotland, and that it is proposed to include two representatives of the Highland and Agricultural Society on the governing body of the college, and inviting the Board, if it should approve of the scheme, to appoint these two representatives.

Rev. Dr Gillespie and Mr J. M. Martin were appointed.

Butter Adulteration.

A letter was read from the Secretary of "The Butter Association" suggesting that steps be taken to strengthen the hands of the President of the Board of Agriculture in carrying the Sale of Foods and Drugs Bill through Parliament.

Mr Hutcheson thought it would be a mistake for the Society not to support the Foods and Drugs Bill, which was one of the best that ever emanated in his time from the Board of Agriculture, and he certainly thought they ought to give it every support. They might also send a letter to Mr Long, showing that the Society had full sympathy with the bill.

Mr Speir seconded.

Dr Gillespie thought that if the National Agricultural Society of Scotland was in favour of the measure they ought to petition Parliament itself and not the Agricultural Department.

This was agreed to.

The Highland Association.

The Secretary intimated an application from the Highland Association for the patronage of the Society, and a contribution towards the annual gathering (Mòd) to be held in Edinburgh on the 6th October next.

Mr FERGUSON moved that they give a donation of £10, 10s., either to be given in medals or money.

Mr CRAN seconded.

Mr SPEIR moved that the application lie on the table.

The amendment was seconded.

On the matter being put to the vote, 8 voted for Mr Speir's amendment, and 15 for Mr Ferguson's motion, which was therefore carried.

WAGGONS FOR CATTLE TRANSIT.

A letter was read from Mr W. Moffat stating that the managers of the Scotch railway companies had further considered the question of providing special cattle-waggons for the conveyance of cattle by passenger trains, but regretted that they did not see their way to meet the wishes of the Directors of the Society in the matter.

The following Committee was appointed to prepare list of office-bearers for 1899-1900—viz.: Sir John Gilmour, Convener; Mr Elliot, Mr M'Hutchen Dobbie, Mr Lumsden, Sir James H. Gibson-Craig, Bart., Captain Dundas, Mr David Wilson, Mr Macpherson Grant, Dr Gibb, and Messrs M'Caig and Clark.

MEETING OF DIRECTORS, 3RD MAY 1899.

Present.—Ordinary Directors—Sir Ralph Anstruther, Bart.; Mr R. Paterson, Hill of Drip; Mr John Cran, Kirkton; Mr John Speir, Newton; Mr George Dun, Easter Kincaple; Mr David Wilson of Carbeth; Mr W. H. Lumsden of Balmedie; Mr J. Macpherson Grant, Old Milton; Mr Walter Elliot, Hollybush; Mr Alexander Cross of Knockdon; Mr W. T. Malcolm, Larbert; Captain R. Dundas, yr. of Arniston; Mr John M'Caig, Challoch; Mr Jonathan Middleton, Clay of Allan; the Master of Polwarth, Humbie House; Mr E. Hedley Smith, Whittinghame; Mr William Clark, Netherlea Farm; Mr R. Shirra Gibb, Boon. *Extraordinary Directors*—Mr James Hope, East Barns; Mr Gavin Jack, Swanston; Mr J. Scott Dudgeon, Longnewton; Mr C. M. Cameron, Balnakyle; Mr James Lockhart, Mains of Airies; Mr William Ford, Fentonbarns; Mr J. M. Martin, Edinburgh; Mr Andrew Hutcheson, Beechwood; Mr John Wilson, Chapelhill. *Treasurer*—Sir James H. Gibson-Craig of Riccarton, Bart. *Hon. Secretary*—Sir John Gilmour of Montrave, Bart. *Chemist*—Dr A. P. Aitken. *Auditor*—Mr William Home Cook, C.A. *Veterinary Surgeon*—Principal Williams. Sir John Gilmour of Montrave, Bart., in the chair.

On the motion that the minutes of last meeting be adopted, Mr SPEIR asked whether the gentlemen appointed to represent the Board of the Highland Society on the Board of the South-Western Agricultural College had been appointed for life or for the term of their office on this Board, or if from year to year, and if from year to year, when that year ends?

The CHAIRMAN said that of course they were only elected for one year, and their successors would be appointed in the beginning of November each year.

The minutes were then approved of.

TOWN COUNCIL GRANT.

A letter was read from the Town Clerk of the city of Edinburgh intimating a grant of 400 guineas to the expenses of the Edinburgh Show.

On the motion of the CHAIRMAN, a cordial vote of thanks was accorded to the Town Council of Edinburgh for their handsome donation.

WARBLE FLY.

A letter was read from Mr M'Hutchen Dobbie suggesting that there should be an exhibition at the Edinburgh Show of Hides affected by the warble fly, in order that stock-owners might see what was complained of by purchasers of hides.

The proposal was unanimously agreed to, and the Secretary instructed to make arrangements for having the exhibition.

CLIPPING REGULATIONS.

Mr JOHN M. MARTIN, in terms of notice given, moved—"That for future Shows the regulations in force previous to 1899 regarding the clipping of sheep be restored."

In speaking to the motion, Mr Martin said that it was designed simply to give effect to the replies to the circular that had been sent out by the Society to exhibitors, who, very probably, were best qualified to say what should be the date at which sheep should be clipped.

Mr Walter Elliot seconded the motion, which was unanimously agreed to.

Wood-Pigeons.

Mr George Dun, in terms of notice, moved—"That in view of the great damage done to farm crops by wood-pigeons, the Directors of the Highland and Agricultural Society communicate at once with landowners and local agricultural societies throughout Scotland urging that an effort should be made to reduce the number of these pigeons." In speaking to the motion, Mr Dun said that in November 1893 they had in Fifeshire a wholesale importation of wood-pigeons. Their numbers exceeded anything seen in Fife during the previous twenty-five years. From 1869 to 1873 a successful raid had been made by the farmers in Fifeshire against those depredators. Eight parishes combined and raised subscriptions for the purpose of killing them out. A great many thousands of pigeons were during these years destroyed. They paid a ½d. per foot to those who killed the pigeons. This, of course, did not remunerate them for the expenditure, but pigeons were marketable articles, and the payment of the ½d. was made in order to ensure that the work was being done. They paid for them by the foot, because poulterers are not inclined to take pigeons without their heads. He would like to see a similar raid conducted throughout Scotland on the same lines. If it were carried out thoroughly, depredations amongst young turnips would be remedied.

Mr Jonathan Middleton seconded.

The Chairman pointed out that they could not deal with the pigeons exactly on the same lines as with the rooks, because very large numbers of them were imported, and came from Germany and other places, and they would therefore require to operate against them at other seasons as well as during the breeding season.

The Master of Polwarth was of opinion that they would be better to wait and see the result of the crusade against the crows, and then they would have some guide as to their future action. He suggested that there should be a general remit to a Committee to consider the damage done to crops by birds.

Mr Macpherson Grant seconded the Master of Polwarth's motion, which, on a vote, became the finding of the meeting.

The Committee appointed consists of the Master of Polwarth, Mr Macpherson Grant, Dr Gibb, and Messrs Dun, Elliot, Hutcheson, and Middleton, with the chairman as Convener.

Veterinary Medals.

The Minutes of meetings of Committee on 1st April and 3rd May were read relative to medals given to the veterinary colleges. An arrangement had been come to which was satisfactory to the Principals of all the colleges, and on their behalf Principal Williams conveyed their thanks to the Society for the encouragement they were giving them.

Professor Cossar Ewart's Experiments.

The Chairman reported that the Committee appointed to look into this matter had met that morning. A deputation consisting of the Chairman, Mr Hutcheson, Mr Martin, Mr M'Hutchen Dobbie, with the Secretary, recently spent an afternoon at The Bungalow, and went over the whole of the work carried on by Professor Ewart, who explained the scope of his experiments, and what he had learned and gained by them. The Committee were convinced that not only in the interests of science but also in the interests of stock-breeders of all kinds the work being carried on by Professor Ewart was worthy of encouragement. A great many questions affecting cross-breeding, the relative influence of the male and female parents, and other points besides that of telegony were being investigated, and the Committee were unanimously of opinion that it would be a misfortune were the progress of these experiments delayed at this point. They therefore asked for instructions to approach other bodies in order that the experiments might be continued for some time longer, and also that leading stock-owners might look into the matter. The Committee further recommended that Professor Ewart should be asked to exhibit his hybrids at the Edinburgh Show.

The report was adopted, and the Committee continued.

MEETING OF DIRECTORS, 7TH JUNE 1899.

Present.—Ordinary Directors—Sir Ralph Anstruther of Balcaskie, Bart.; Mr Robert Paterson, Hill of Drip; Rev. John Gillespie, LL.D., Mouswald Manse; Mr John Cran, Kirkton; Mr C. H. Scott Plummer of Sunderland Hall; Mr George Dun, Easter Kincaple; Mr David Wilson of Carbeth; Mr J. M'Hutchen Dobbie, Campend; Mr Walter Elliot, Hollybush; Captain Clayhills Henderson of Invergowrie, R.N.; Mr W. T. Malcolm, Dunmore Home Farm; Mr Wm. Duthie, Collynie; Mr Jonathan Middleton, Clay of Allan; Mr E. Hedley Smith, B.L., Whittinghame; Mr William Clark, Netherlea Farm; Mr W. S. Ferguson, Pictstonhill; Mr R. Shirra Gibb, Boon; Mr A. M. Gordon of Newton. *Extraordinary Directors*—Sir Archibald Buchan Hepburn of Smeaton, Bart.; Bailie Thomas Sloan, Edinburgh; Mr James Hope, East Barns; Mr G. R. Glendinning, Hatton Mains; Mr Gavin Jack, Swanston; Sir Robert Menzies of Menzies, Bart.; Mr James Lockhart, Mains of Airies; Sir Robert D. Moncreiffe of Moncreiffe, Bart.; Mr John M. Martin, Edinburgh; Mr Andrew Hutcheson, Beechwood; Mr John Wilson, Chapelhill; Mr Wellwood Maxwell of Kirkennan. *Teasurer*—Sir James H. Gibson-Craig of Riccarton, Bart. *Hon. Secretary*—Sir John Gilmour of Montrave, Bart. *Chemist*—Dr A. P. Aitken. *Auditor*—Mr W. Home Cook, C.A. *Veterinary Surgeon*—Principal Williams, F.R.C.V.S. Sir John Gilmour of Montrave, Bart., in the chair.

EDINBURGH SHOW.

The Royal Visit.—The Secretary intimated that the Committee had now almost completed arrangements for the Royal Visit. H.R.H. the Prince of Wales is to arrive on Wednesday, and will proceed to the showyard, driving into the large ring in state, where he will present the champion gold medals to the winners. At 12.30 he will preside at the meeting of the Society, and will return to the grand stand at 2.30. On Thursday he is to receive the freedom of the city, returning to the showyard at one o'clock.

Mr MACDONALD further intimated that he had been asked to supply schools and employers of large works with bundles of tickets at a reduced rate. After some discussion, it was agreed that no reduction from the ordinary admission rates be allowed.

STIRLING SHOW.

The SECRETARY intimated that he had received permission to the holding of the Stirling Show of 1900 in the King's Park.

The SECRETARY intimated that the County Council of Stirlingshire have agreed to a voluntary assessment of ½d. per pound on owners of lands and heritages. Dunbarton County Council had intimated that any aid from the county should be raised by private subscription. Perthshire had agreed to voluntary assessment.

Mr MAXWELL suggested that application should be made in future to the Commissioners of Supply, who met annually in April or May. They could resolve to assess themselves.

It was agreed to approach the County Council of Dunbarton again.

INVERNESS SHOW.

The SECRETARY intimated that the Finance Committee of the County Council of Inverness had resolved to impose an assessment of ½d. in the pound on all owners and occupiers of lands and heritages paying more than £100 of rent. The Morayshire County Council could not see their way to impose voluntary assessment, but were willing to advertise for and receive subscriptions. He had approached them again, but they could not depart from their former finding. Sutherlandshire could not recommend a voluntary assessment, but had decided to issue circulars asking for subscriptions; and Caithness had decided to take no action in the matter.

Dr GILLESPIE thought this a very serious state of matters. The local subscription formed a very considerable item in the receipts of the Society, and in one Show district it amounted to the handsome sum of £1700. He had made inquiry into the matter, and found that at the last three Shows at Inverness the Society lost £3200. He believed there was a strong desire on the part of those responsible for the management of the Society to visit Inverness, but, in accordance with previous resolutions, they could not go to a district unless it gave a good local contribution, and they had now reached a stage when the whole matter should be looked in the face. He thought it better to proceed by specific resolutions rather than in general terms, as in the case of Dunbarton, and he accordingly begged to move the following resolution:—

"While acknowledging the handsome contribution from the county of Inverness, the Directors have learned with much concern and regret that several of the county councils in the Inverness district have not seen their way either to agree to a voluntary assessment or to take adequate means to raise a satisfactory local fund in aid of the expenses of the proposed Highland Show at Inverness in 1901; and further, having in view the fact that former Highland Shows at Inverness have, even with the support of a substantial local fund, resulted in heavy losses to the Society (the losses upon the last two Inverness Shows amounting to over £3200), and having in view also the hearty support accorded to the Society in other show districts, the Directors feel that, with due regard to its duties and obligations to the rest of the country, the Society cannot visit Inverness with the Show of 1901 unless adequate means are taken by the counties in the district to raise a reasonably substantial local fund. The Directors therefore, desiring that every effort should be made to secure to the Inverness district its usual visit from the National Show, appoint a Committee to take what steps may seem desirable to promote the raising of a local fund in aid of the proposed Inverness Show of 1901, and report to the meeting of the Board on the first Wednesday of November, the Committee to consist of the Directors for the Inverness Show district, with power to add to their number."

Sir ROBERT MONCREIFFE seconded, and the motion was agreed to.

CABBAGE AS A FARM CROP.

The SECRETARY read a letter from Mr John Gillies, market-gardener, Levenhall, Musselburgh, offering (*a*) a prize of £10 for the best essay on "The Growth and Use of Cabbages as a Farm Crop"; and (*b*) a sum of £100 as prizes for best plots of cabbages grown from plants supplied by him.

On the motion of Mr HUTCHESON it was agreed to accept the first offer; but the second one was rejected on the motion of Mr W. S. FERGUSON, who thought they ought to accept nothing of the kind.

MEDALS FOR VETERINARY COLLEGES.

The SECRETARY said that a list of the subjects for which the Society's medals to the Scottish Veterinary Colleges are to be awarded had been drawn up.

VETERINARY DIPLOMA.

The Minute of meeting of Committee held last week was read. The Committee had explained to the veterinary surgeons that they could not hold out any hope of pecuniary aid in promoting a bill in Parliament, but recommended that the following resolution be adopted: "The Highland and Agricultural Society are in sympathy with the Royal College in their desire that the holders of the veterinary diploma of the Society shall be placed on the same footing as the other members of the profession in being subject to the disciplinary powers of the College, and if the College introduce a measure into Parliament for this purpose, the Highland Society will petition in its favour."

On the motion of Mr MARTIN the minute was approved of and the resolution carried.

DAMAGE BY ROOKS.

The minute of meeting of Committee held same day was read. The Committee consider that after having dealt with the rook the only other two birds to be dealt with would be the wood-pigeons and sparrows, and recommended that the Chairman and Secretary be authorised to draw up a circular to be sent to landowners and agricultural societies throughout the country, pointing out certain modes of reducing the number of the birds.

This was agreed to.

SCIENCE.

The Minute of meeting of Science Committee held on same day was submitted. The Committee recommended that the experiments in the feeding of sheep, conducted last season by Mr M'Caig, Challoch, be continued on similar lines but on two farms instead of one, and they also recommended that it be remitted to a sub-committee to arrange with two farmers to carry out the experiments. The outlays are not expected to exceed £80.

This was agreed to.

PROFESSOR EWART'S EXPERIMENTS.

The SECRETARY intimated that the Secretary of the Royal Agricultural Society of England had written stating that they were sending a deputation to inspect Professor Cossar Ewart's experiments.

This was all the business.

MEETING OF DIRECTORS, 1st NOVEMBER 1899.

Present.—Ordinary Directors—Mr John Speir, Newton Farm; Mr David Wilson of Carbeth; Mr J. M'Hutchen Dobbie, Campend; Mr W. H. Lumsden of Balmedie; Mr John Macpherson Grant, yr. of Ballindalloch; Mr Alexander Cross of Knockdon; Captain Clayhills Henderson of Invergowrie, R.N.; Mr W. T. Malcolm, Dunmore Home Farm; Mr William Duthie, Tarves; Mr John M'Caig, Challoch; Mr Jonathan Middleton, Clay of Allan; Mr E. Hedley Smith, B.L., Whittinghame; Mr William Clark, Netherlea; Mr R. Shirra Gibb, Boon; Mr Alexander M. Gordon of Newton; Mr R. Sinclair Scott, Burnside; Sir Robert D. Moncreiffe, Bart.; Mr John Murray, Munnieston; Mr John Marr, Cairnbrogie; Rev. John Gillespie, LL.D., Mouswald Manse; Mr C. M. Cameron, Balnakyle; Mr C. H. Scott Plummer of Sunderland Hall. *Extraordinary Directors*—Sir Allan H. Seton Steuart of Touch, Bart.; Mr John J. Moubray of Naemoor; Mr William Drysdale, King o' Muirs; Mr John Edmond, Galamuir; Mr James Lockhart, Mains of Airies; Mr William Ford, Fentonbarns; Mr John M. Martin, Edinburgh; Mr Andrew Hutcheson, Beechwood; Mr John Wilson, Chapelhill; Mr George R. Glendinning, Hatton Mains; Mr John Cran, Kirkton. *Treasurer*—Sir James H. Gibson-Craig of Riccarton, Bart. *Hon. Secretary*—Sir John Gilmour of Montrave, Bart. *Chemist*—Dr A. P. Aitken. *Auditor*—Mr William Home Cook, C.A. Sir John Gilmour, and afterwards Mr Alexander M. Gordon of Newtown, in the chair.

Minutes.

The Minutes of meeting of Directors, and of General Meeting held on 7th June, of meeting of Directors held in Edinburgh showyard on 5th and 6th July, and of General Meeting of Members held in showyard on 5th July, were adopted.

Election of Chairman.

Rev. Dr Gillespie said the time had now come for Sir John Gilmour to vacate the chair, which he had occupied for two years. The Board in Committee had discussed the question, and it now fell to him as their spokesman formally to move that Mr A. M. Gordon of Newton be elected Chairman for the ensuing year. Mr Gordon's name would be received with the greatest acceptance by every member of the Board, and they would all have the greatest possible pleasure in having him as their Chairman. They all knew him as a worthy and active member of the Board, and also as an administrator of the greatest county in Scotland.

Mr Jonathan Middleton seconded the motion. He was confident that Mr Gordon would serve the Board with his customary tact and ability.

Sir John Gilmour put the motion to the meeting that Mr A. M. Gordon be elected Chairman for the ensuing year, and it was carried by acclamation. He then formally intimated to Mr Gordon that he had been elected Chairman.

Mr Gordon took the chair, which had been vacated by Sir John Gilmour, and was again greeted with hearty applause. Addressing Sir John, he thanked him and the members most heartily for the great honour they had conferred upon him. Sir John was retiring from the office in a perfect halo of glory, and it was no easy thing to come after so capable an exponent of the duties of the office. Another reason why he had some delicacy in accepting was the distance of his home from the place of meeting. It meant that he had to be from home three days to attend each meeting, and therefore he had to throw himself on the indulgence of the Board if he did not attend quite in the same way as his illustrious predecessor. Before beginning the regular business he asked that a special vote of thanks be accorded Sir John Gilmour for the invariable success which had attended their work during the past two years. On Sir John's shoulders to a large extent lay the success of the Edinburgh Show, and with his he desired to couple the name of Sir James Gibson-Craig, as, but for the efforts of these two, the Board would not have found themselves in such a favourable position as that in which they stood that day.

Mr Andrew Hutcheson seconded the motion.

Sir John Gilmour briefly acknowledged the very kind words which were spoken, which would ever be held as of great value by him. During the time he was Chairman he had nothing but pleasure in connection with the work of the office, and this had been brought about chiefly by the cordial co-operation of every member of the Board during these years. Long might this continue to be the feature around that table, and as long as it was so they would be performing a duty demanded of them by their countrymen. He would always look back to the success of the past two years' work with pleasure and delight, and especially of the year which had closed,

in which they had held what they might, in more ways than one, characterise as their Royal Show.

Sir JAMES GIBSON-CRAIG thanked the meeting and the Chairman for the kind mention they had made of his name in connection with the Edinburgh Show. It was a great satisfaction to him to be able to assist in carrying through that great event as it had been carried through. He had, personally, to acknowledge that their new Chairman would make a great personal sacrifice while fulfilling that office, and for himself he desired to say that nothing he could do to lighten the Chairman's labours would be spared.

STANDING COMMITTEES.

The Standing Committees for the year were adjusted.

RESIGNATION OF DIRECTOR.

A letter was read from Captain Stirling of Keir resigning his seat on the Board on account of his having been appointed to the Egyptian army for service in the Soudan. The Board received the resignation with regret, and in the usual way remitted it to the directors for the Stirling district to bring up a recommendation to the next meeting of the Board.

PAVING GEORGE IV. BRIDGE.

Sir JAMES GIBSON-CRAIG mentioned that George IV. Bridge was to be taken up in order to lay the cable tramways, and the proprietors in the vicinity and the County Council were taking action to secure that it be relaid with wood, and he asked that the Society should co-operate to secure this desirable improvement.

Power was given to the Secretary to act in this direction on behalf of the Society.

EDINBURGH SHOW.

Accounts.—Sir JAMES GIBSON-CRAIG reported that while they were not able to give the exact figures in connection with the Edinburgh Show, so far as the accounts had been made up there would be a balance to the good of about £4200. Some deductions would yet fall to be made in connection with the arrangements about the ground, but the Committee were of opinion that a sum of not less than £4000 would be added to the capital.

The CHAIRMAN said this was a highly satisfactory result, on which all were to be congratulated.

Sir JAMES GIBSON-CRAIG desired to mention that the Board was very deeply indebted for special assistance in furnishing the Royal pavilion to Messrs Cranston & Elliot, and in decorating the grounds to the Messrs Methven, and he formally moved that a special vote of thanks be awarded to these firms.

Mr MACPHERSON GRANT seconded, and the motion was cordially adopted.

List of Awards.—The SECRETARY formally laid on the table the list of awards at the Edinburgh Show.

Transference of Members' Tickets.—The SECRETARY reported that only one case of transference of members' tickets had been brought under the notice of the Committee. The explanation given was that the member had handed the ticket to his son without thinking, and he had expressed regret for doing so. It was agreed to take no further notice of the matter.

Polled Cattle Society's Gold Medals.—Some correspondence had taken place between Mr Ramsay, Secretary of the Polled Cattle Society, and the Secretary regarding the award of the gold medal of this Society. On the motion of the Chairman the matter was remitted to a Committee for consideration and report.

Machinery Trials.—Mr JONATHAN MIDDLETON formally laid on the table the reports on the trials of oil-engines and manure-distributors. Mr Middleton desired the Directors to pass a special vote of thanks to Mr Macdonald, the tenant of Granton Mains, for putting a field at the disposal of the Committee of the Society on which the manure-distributor trials had taken place. This was unanimously agreed to.

Honoraria.—On the recommendation of the Finance Committee, the Directors unanimously voted the following sums to the members of the Society's staff in recognition of their extra duties in connection with the Edinburgh Show, and also as a memento of the success of that meeting—viz.: The Secretary, £200; Auditor (who acts as Treasurer at the Society's Shows), £50; chief clerk, £50; second clerk, £20; messenger, £10.

Professor Cossar Ewart's Zebra Hybrids.—On the motion of the Shows Committee, it was unanimously resolved to award the Society's large gold medal to Professor Cossar Ewart for his collection of Zebra Hybrids exhibited at the Edinburgh Show, and in recognition of the value of his experiments in the breeding of live stock.

Stirling Show, 1900.

Local Fund.—A letter was read from the County Clerk of Clackmannan intimating that his County Council had agreed to raise a sum in aid of the Show by means of a voluntary assessment of one-eighth of a 1d. per pound on owners of land.

A letter was also read from the County Clerk of Dunbartonshire, intimating that his County Council adhered to their decision not to raise a local fund by means of voluntary assessment.

Dr Gillespie moved that it be remitted to the Directors of the Stirling district to take such steps as they might think best to raise a local fund in Dunbartonshire. This was agreed to.

Site.—A letter was read from the Secretary of State for War giving permission for the holding of the Show in the King's Park.

Railway Station.—The Secretary stated that he had had an interview with Sir James Thompson regarding the reconstruction of the railway station. Sir James assured him that the platforms, alike for passengers, live stock, and goods traffic, would be reconstructed and in order before the time for the Show. They would not interfere with the building till after the Show.

Prize-List.—It was agreed, on the motion of Dr Gillespie, to grant the prayer of the Galloway Cattle Society, and arrange that the date of calving for Galloway cattle should be counted as from 1st December instead of 1st January, thus placing the breed on the same footing as the Aberdeen-Angus cattle.

A large number of special prizes were intimated.

Forage.—Arrangements were left to Committee, as were also the hotel and catering. The new Committee for forage is Mr W. S. Ferguson, Mr John M'Hutchen Dobbie, Mr G. R. Glendinning, Mr W. T. Malcolm, and Mr John Edmond.

Inverness Show, 1901.

Various letters were read relative to the proposed Inverness Show of 1901. The first, from the Town Clerk of Inverness, intimated a grant of 50 guineas from the Town Council; the second, from the County Clerk of Ross and Cromarty, intimated that his County Council had resolved to endeavour to raise a sum of from £300 to £350 by voluntary assessment; the third, from the County Clerk of Caithness, intimating a voluntary assessment of ¼d. per pound upon all owners and occupiers of lands whose rental amounts to £100 and upwards per annum, the collection to be made by the Caithness Agricultural Society; the fourth, from the County Clerk of Sutherland, intimating that his County Council had resolved not to impose a voluntary assessment; the fifth, from the Nairn County Council, intimating their resolution to impose voluntary assessment, provided the Show be held at Inverness.

With regard to the Caithness grant, the Secretary was instructed to ask the County Council to arrange to have the voluntary assessment collected along with the ordinary county rates.

In connection with Sutherland, a letter was read from Mr MacLean, factor to the Duke of Sutherland, intimating a donation by his Grace of £25; the Inverness Farmers' Society intimated a grant of the same amount as in 1891. Mr Jonathan Middleton intimated that the Easter Ross, Wester Ross, and Black Isle Farmers' Societies had agreed amongst them to contribute £100.

In view of all these promises of support Dr Gillespie formally moved that, "Subject to the approval of the Annual General Meeting, the Show of 1901 be held in the Inverness town park, at Tomnahurich, provided satisfactory arrangements can be completed."

The Secretary explained that he had visited the park on the invitation of the Town Council, and had found it admirably suited for the purposes of the Show. The Town Council had also promised, besides the grant, to take other measures calculated to promote the success of the Show.

This was agreed to.

Abortion amongst Farm Animals.

Mr John Speir, in accordance with notice given, moved—"That a Committee be appointed to consider and report as to the advisability of entering on a series of investigations regarding abortion among farm animals, with the view of obtaining some better knowledge in regard to it."

Mr Scott Plummer seconded the motion.

The Secretary read a letter which he had received from the Board of Agriculture, dated 13th October, in which they said that no inquiry had at any time been made by the Board into this question or by their predecessors the Privy Council, but Sir George Brown, who had been their veterinary adviser for many years, had taken part

in the inquiry conducted by the Royal Agricultural Society of England from 1890 to 1894. Some experiments are proceeding under the superintendence of the Board of Agriculture at Wye and at Nottingham, but it will be some time before anything definite can be reported regarding them.

The motion was agreed to.

Sir JOHN GILMOUR proposed that in place of appointing a new Committee they should remit this to the present Committee on Tuberculosis, and add the names of Mr Duthie, Mr Grant, and Mr Speir.

This was agreed to.

PARIS EXHIBITION, 1900.

On the invitation of the President of the Society of Agriculture of France, the Board nominated Mr Gordon of Newton, Sir John Gilmour, and the Secretary as their representatives to attend the meetings which will be held in Paris during the Exhibition in 1900. It was agreed not to prepare any report or memorial on the subject of the agriculture of Scotland in connection with that Exhibition.

TUBERCULOSIS AMONGST CATTLE.

The SECRETARY read minutes of Committee meetings held on 6th April and on 1st November. In connection therewith the Committee had addressed a letter to the Board of Agriculture and Royal Agricultural Society, inviting them to co-operate with the Directors of the Highland and Agricultural Society, in order, if possible, to secure concerted action on the part of the national agricultural societies of England and Scotland, with the countenance and support of the Board of Agriculture, towards taking some steps which might be useful in eradicating tuberculosis. The points which the Committee thought might usefully be inquired into were the manufacture, use, and action of tuberculin in this country. The Committee were hopeful that the conclusion as to the reliable nature of tuberculin as a test would prove well founded; but, unfortunately, circumstances had come to their knowledge which raised grave doubts as to whether tuberculin, as it is at present generally procured and employed in this country, is really sufficiently reliable as a test. It was, however, of primary importance that all uncertainty upon this question should be removed, that such knowledge should be obtained and disseminated regarding the manufacture and use of tuberculin as would reduce the risk of error to the lowest possible point. The Committee were of opinion that tuberculin had not been submitted to a sufficiently exhaustive test in this country. The test had been too one-sided. Only animals had been slaughtered which had reacted, and while it is, of course, important to know whether animals which have reacted are tuberculous, it is, perhaps, still more important to know whether animals which have not reacted are free from tuberculosis. The Committee were strongly of opinion that a series of carefully conducted experiments, followed by post-mortem examination, both of reacting and non-reacting animals, might do much to place the question of the reliability of the tuberculin test on a clear and sure footing. They were also of opinion that attention should be given to the methods pursued by Professor Bang of Denmark, and object-lessons on the same lines in this country might be expected to induce many stock-owners to adopt similar means.

The Board of Agriculture, in reply, doubted whether they could with any advantage to those concerned give effect to the suggestion contained in Mr Macdonald's letter. There could be little doubt that tuberculin test is of considerable diagnostic value. In the view of the Board, stock-owners are in possession of information sufficient to enable them to determine for themselves what steps, if any, it might be practicable for them to take with a view to the eradication of tuberculosis in their herds, and for those and other reasons the Board did not think it desirable that they should take part officially in the proposed further experiments, but would watch the proceedings of the Royal and Highland Societies with much interest, and would be glad to be informed from time to time of the results obtained and the conclusions arrived at.

In their reply the Royal Agricultural Society go into the question minutely. Whilst not able to see their way to embark in the elaborate and costly experiments suggested by the Committee of the Highland and Agricultural Society, the Council are of opinion that there may be advantage in the institution of experiments on a moderate scale in the direction of infecting healthy cattle of various ages with tuberculosis, and they have given instructions for a series of experiments of this nature to be conducted by the Royal Veterinary College, in connection with the scientific investigations conducted by that College for the Royal Society. The Council fully recognise the importance of the question of preventing the spread and limiting the ravages of tuberculosis, which they have constantly under their anxious consideration, and will be pleased to co-operate with the Highland and Agricultural Society in any well-considered steps devised to accomplish this end.

The Committee expressed regret that neither of the parties had seen their way to join with the Society in efforts to lessen the prevalence of this disease in cattle, and they recommend that a grant of £250 be made, and that arrangements be come to with members of the Society and with public institutions to conduct researches as to the value of the tuberculin test.

Dr GILLESPIE, in moving the adoption of the report, said he never had read a more disappointing letter than that from the Board of Agriculture. It was very much like throwing a wet blanket on any serious attempt to deal with this question. The Board of Agriculture had practically folded their arms again and given the whole thing the go-by. There were two things in the report which had been laid on the table, the suggestion as to testing the value of tuberculin under different conditions and circumstances, and the suggestion to get individuals to carry out experiments on the same lines as Bang's experiments in Denmark. The first of these suggestions was to get public institutions or asylums to test their animals, and make post-mortem examinations, with a view to learning as to the efficacy of the test. In regard to the second recommendation, various gentlemen, such as Sir Thomas Carmichael and Mr Speir, had made efforts to carry out experiments on Bang's lines, and with a large measure of success. What the Committee proposed was to get the co-operation of the members of the Society to carry out this work. One of their own members had agreed. He referred to Mr Cross of Knockdon. This offer the Committee recommended should be accepted. It would not be a very costly business for the Society. Of course he admitted that if any objection was made to grant this £250 now, it would be better to postpone consideration of the question until the Board had time to fully consider the Committee's report.

Mr D. WILSON moved that consideration of the report be deferred till next meeting of the Board.

Mr SPEIR seconded, and this motion was agreed to.

PUBLICATIONS COMMITTEE.

A discussion took place on the minutes of the Publication Committee of this date with regard to giving copies of 'Transactions' free to district libraries. The Committee recommend that they be given to such institutions at cost price—viz., 3s. per copy.

Mr MARTIN proposed that where applications came from *bona-fide* district libraries the copies should be given gratis.

Mr ANDREW HUTCHESON seconded.

Ultimately, however, after discussion, in which the proposal of the Committee was supported by Sir John Gilmour, Dr Gillespie, and Mr Duthie, Mr Martin withdrew his motion, and the proposal of the Committee became the finding of the meeting.

SHEEP-FEEDING EXPERIMENTS.

The report of the Science Committee, held same day, was read, in which it was minuted that Mr Hutcheson, Airleywight, had agreed to carry out sheep-feeding experiments on the same lines as those carried out last year by Mr M'Caig in Wigtownshire, and it was recommended that a grant of £60 be made for this purpose. A vote of £10 was made to Dr Aitken for his work in connection with the sheep-feeding experiments, and of £25 in connection with the basic slag experiments.

WEST OF SCOTLAND AGRICULTURAL COLLEGE.

A letter was read from the interim secretary of this college, asking continuance of the £60 granted to the Scottish Dairy Institute to the Dairying Department of the West of Scotland Agricultural College, into which the Dairy Institute had now been merged. The letter also asked for a grant for prizes for students attending the college. A spirited discussion ensued.

Mr CROSS said he did not think that this grant need further be made, as the college was supported by County Councils.

Dr GILLESPIE, as chairman of the governors of the college, said that in present circumstances he had to urge that the grant which had been made to the Scottish Dairy Institute be continued to the Dairy Department of the West of Scotland Agricultural College. He could not agree with Mr Cross. This college would now be the only institution in Scotland where dairy education was given. He did not think the Society would be entitled to give a grant to the West of Scotland College in itself, any more than to the other agricultural colleges in the country, but he strongly urged that the grant should be given to the dairying department, as it was the only one of its kind in Scotland. They would not be warranted in withdrawing the grant until they could say that the work, which had hitherto been done by the Scottish Dairy Institute, could be carried on without it. The matter of prizes did

not press, but they thought that, seeing prizes were given to students attending Edinburgh University, they should also be given to the students attending the West of Scotland Agricultural College. He moved that the grant of £60 for the Kilmarnock Dairy School be continued.

Mr HEDLEY SMITH asked if any grant was given to any of the schools in Edinburgh, either the School of Rural Economy or the University?

The SECRETARY said that, apart from the vote of £50 to the lectureship on forestry in in the University of Edinburgh, no grant had been given for years, except to the Scottish Dairy Institute.

Mr SMITH was of opinion that it should be discontinued.

Mr JOHN M'CAIG did not understand the logic of Mr Cross's position, nor yet the position of Mr Smith. Dairying was as much needed as ever it was, and the same grounds existed now as ever for giving a grant to the Kilmarnock School. He would only be too glad if the grant were £100 instead of £60. He seconded Dr Gillespie's motion.

Mr SPEIR pointed out that the grants to the forestry classes in Edinburgh were of the same nature as those for dairying in the West of Scotland.

Mr CROSS argued that formerly the Scottish Dairy Institute was supported by voluntary contributions, but now the West of Scotland College was supported by the County Councils.

Mr ANDREW HUTCHESON moved that a grant of £100 be given to the West of Scotland Agricultural College. It was the only agricultural college pure and simple in the country, and as such he thought it was worthy of their support.

Mr JAMES LOCKHART seconded.

Dr SHIRRA GIBB said he had no intention of interfering in this debate, but Mr Hutcheson's motion compelled him to do so. He moved that the grant to the Kilmarnock Dairy School be withdrawn. It had been argued by some speakers that there was great risk of these local subscriptions being withdrawn which had hitherto been given to the Scottish Dairy Institute. That appeared to him to show that those who knew best about it considered that these grants were no longer necessary, and he could not see on what ground the Highland and Agricultural Society should be asked to increase it.

Mr JOHN MARR seconded. He thought if they were going to make grants in this way Aberdeen would have a good claim also, and he was not prepared to admit that the work done there was not as worthy as that of the West of Scotland.

The CHAIRMAN pointed out that no general grants had been given for agricultural education since 1892. They had only given special grants for special subjects—such as forestry and dairying—and it appeared to him, with all due deference to Mr Hutcheson, that if they were to agree to his motion they would have applicants for grants all round, and they would not be able to make distinctions.

After some further discussion Mr Hutcheson and Dr Gibb withdrew their motions, and Dr Gillespie's motion became the unanimous finding of the meeting.

NATIONAL DIPLOMA IN AGRICULTURE.

The SECRETARY laid on the table the minute of Joint-Committee and the syllabus of the first joint examination for this new diploma.

Dr GILLESPIE moved the approval of the report and syllabus. As a member of the Joint-Committee he had to express the great satisfaction he had in attending the meetings, which had been of the most harmonious character.

Mr ANDREW HUTCHESON seconded. He was glad to see they were going to give two years to carrying through the examinations, instead of pressing it into one as at present.

Mr HEDLEY SMITH wished to know if it would be the case that all who got the diploma would become free life members of both the Highland and Royal Agricultural Societies.

The SECRETARY, in reply, said it was intended that no free life memberships be given by either Society.

Dr Gillespie's motion was then unanimously agreed to.

FINANCE COMMITTEE.

The SECRETARY read report of meeting of Finance Committee, in which authority was asked to invest the sum of £4000, and to carry through the arrangements necessary for completing this. Thirty-three members of the Society were in arrears of subscriptions for three years, and authority was asked to delete the names of these members from the roll in accordance with the usual practice.

Agreed.

It was agreed to hold the next meeting of the Board on Wednesday, 29th day of November, at 12 noon.

MEETING OF DIRECTORS, 29TH NOVEMBER 1899.

Present. — *Vice-President* — Sir Robert Menzies of Menzies, Bart. *Ordinary Directors*—Mr David Wilson of Carbeth; Mr John M'Hutchen Dobbie, Campend; Mr W. H. Lumsden of Balmedie; Colonel Dudgeon of Cargen; Mr John Macpherson Grant, yr. of Ballindalloch; Mr Alex. Cross of Knockdon; Mr W. T. Malcolm, Dunmore Home Farm; Mr John M'Caig, Challoch; Mr Jonathan Middleton, Clay of Allan; the Hon. the Master of Polwarth, Humbie House; Mr E. Hedley Smith, B.L., Whittinghame; Mr William Clark, Netherlea; Mr W. S. Ferguson, Pictstonhill; Mr R. Shirra Gibb, Boon; Mr R. W. B. Jardine, yr. of Castlemilk; Mr Alexander M. Gordon of Newton; Mr R. Sinclair Scott, Burnside; Sir Robert D. Moncreiffe of Moncreiffe, Bart.; Mr John Murray, Munnieston; Mr John Marr, Cairnbrogie; Rev. John Gillespie, LL.D., Mouswald Manse; Mr C. M. Cameron, Balnakyle; Mr C. H. Scott Plummer of Sunderland Hall. *Extraordinary Directors*—Sir Alan H. Seton Steuart of Touch, Bart.; Mr Archibald Forrest, Provost of Stirling; Mr John J. Moubray of Naemoor; Mr John Craig, Innergeldie; Mr Wm. Drysdale, King o' Muirs; Mr John Edmond, Galamuir; Mr James Lockhart, Mains of Airies; Mr John M. Martin, Edinburgh; Mr Andrew Hutcheson, Beechwood; Mr John Wilson, Chapelhill; Mr Wellwood Maxwell of Kirkennan; Mr John Cran, Kirkton; Mr Robert Paterson, Hill of Drip. *Hon. Secretary*—Sir John Gilmour of Montrave, Bart. *Auditor*—Mr Wm. Home Cook, C.A. *Chemist*—Dr A. P. Aitken. *Veterinary Surgeon*—Principal Williams. Mr Alexander M. Gordon of Newton in the chair.

The minutes of meeting of the Directors of 1st November were held as read and approved of. It was agreed to hold the next meeting of the Board on the 10th January, and the anniversary meeting of the Society on 31st January, on which date will also be held the meeting of Directors due in February.

EDINBURGH SHOW, 1899.

A letter was read from Sir Francis Knollys acknowledging, on behalf of the Prince of Wales, a letter regarding the financial success of the Edinburgh Show. His Royal Highness heartily congratulated the Directors upon the great success of the Show.

A letter was also read from Professor Cossar Ewart, dated 31st October, asking the Secretary to convey to the Directors his best thanks for awarding him the gold medal of the Society. It was gratifying to the Professor to find that the extremely intricate nature of the experiments he was conducting, which of necessity postponed any definite deliverance regarding them for a long period, did not debar the Directors of a Society engaged in the practical working of agriculture from acknowledging their importance.

Sir JOHN GILMOUR said in connection with this that they were very grateful to Professor Cossar Ewart for the admirable exhibition of his hybrids which he made at their late Show. It was within the knowledge of all of them that the Professor was making the same exhibition at the York Show of the Royal in June, and he had no doubt that this would tend to extend the interest in this experiment. He trusted that besides the medal which had been so unanimously awarded to the Professor, after these experiments of his had become better known, both the Royal Society and their own would see their way to assist him further in carrying on the labours in the future which he had so thoroughly done in the past on his own account.

STIRLING SHOW, 1900.

The SECRETARY submitted reports of the Show Committee meetings held on 31st October and 29th November. These reports dealt with a variety of details connected with the Stirling Show of 1900. An additional steward is to be appointed for the entrance gates.

Highland Cows.—Communications had been received from Sir Robert Menzies and Mr R. A. Meikle suggesting in effect that the class for Highland cows should be confined to cows with calf at foot. Sir Robert had a motion on the card that farrow cows should not be allowed to compete for the premiums for West Highland cattle along with the cows that have their calves at foot.

The Committee recommended that no action should be taken in the matter, and that the classes should remain as they were at Edinburgh in 1899. The Show Committee had gone carefully into the points raised in Mr Meikle's letter, and had found that only one Highland cow in five years had failed to comply with the regulations as to calving.

Sir ROBERT MENZIES moved that the classes for Highland cows be confined to females in milk or with calf at foot.

Mr W. S. FERGUSON seconded, and after discussion this motion was adopted.

Ayrshires.—The Committee reported that a letter had been received from Mr Robert Wilson, Manswraes, making certain suggestions regarding the prizes and regulations for Ayrshire cows, but the Show Committee, by a majority, recommended that no change should be made.

Mr CLARK then moved that the class for three-year-old heifers in milk should be altered to read, "Class for heifers in milk, calved after 1st January 1897." In other words, that two-year-old heifers in milk should not be debarred from competing.

Mr CROSS seconded.

Mr LOCKHART explained that a division was taken in Committee on the subject, and that he had moved on the lines suggested by Mr Clark but had lost his motion, the argument on the other side being that it would be detrimental to the Ayrshire breed to encourage the putting of such young animals in calf.

Dr GILLESPIE supported Mr Clark's proposal, as a well-grown Ayrshire heifer at two years and five months old, for example, was quite fit to be shown in calf.

On a division, 16 voted in support of the recommendation of the Committee and 12 for Mr Clark's amendment. Consequently no alteration will be made.

Another proposal of Mr Wilson's which the Committee decided to pass by was that the regulation regarding heifers in calf should be the same as for cows in calf. At present a heifer must produce a calf within three months of the Show, whereas a cow is not required to produce a calf until within nine months of the Show.

Mr CLARK moved that heifers be put on the same level as cows, and Mr R. SINCLAIR SCOTT seconded.

The SECRETARY explained how the difference came to be made. It was argued some four years ago that it was fairer to the heifer to insist that she should be about six months gone in calf so as to put her in a better position to compete with the cows.

After some further discussion Mr Clark's amendment was unanimously agreed to.

Horses.—All the classes for horses remain practically as at Edinburgh, except that the Hunter classes will be the same as at Glasgow. With regard to the proposal by the Shire Horse Society, the Chairman asked the Board to be good enough to defer coming to a decision on it until the Show Committee had time to consider it fully. This was unanimously agreed to.

A number of special prizes were accepted.

It was decided to have no competition in butter-making.

Altogether the premium list for Stirling Show in 1900 offers about £600 more in prizes than was offered at the last Stirling Show in 1891.

INVERNESS SHOW, 1901.

There were submitted (*a*) a letter from the County Clerk of Nairnshire intimating that his County Council will impose a voluntary assessment on owners of lands and heritages in aid of the local fund; (*b*) a letter from the secretary of the Inverness-shire Farmers' Society intimating that his club will contribute £75 towards the local fund. The Secretary was instructed to convey the thanks of the Board to both parties.

ELIMINATION OF TUBERCULOSIS.

The Board proceeded to consider the following minute of a Special Committee of 1st November 1899—viz.: (1) "The Committee regret that the Board of Agriculture has not seen its way to more cordially encourage the efforts to eliminate tuberculosis from cattle. (2) The Committee recommend that they be reappointed, with power to endeavour to arrange with one or more breeders of cattle to carry out experiments with tuberculin on the lines followed by Professor Bang, and that a sum of £250 be voted for this purpose. (3) The Committee further recommend that they have power to arrange with public institutions or other bodies to conduct researches as to the value of the tuberculin test."

Dr GILLESPIE, in moving the adoption of the minute, reviewed the relation of the Society to this question, pointing out that six years ago a proposal was made that the Society should take action, but on account of inquiries then going on, and the medical Royal Commission on the subject, nothing had been done.

Sir ROBERT MENZIES seconded.

Mr JOHN MARR begged to move that the Society follow the example of the Board of Agriculture, and pursue a policy of masterly inactivity. He submitted that the Doctor had not made out a very strong case for the spending of £250.

Mr Marr's motion was not seconded.

Mr Wilson protested against the resolutions of the Committee as they appeared on the paper. They really amounted to a vote of censure on the Board of Agriculture. Was it reasonable to make this the first occasion upon which the Board of that influential Society should pass a vote of censure on the Board of Agriculture? He thought they could find other things in connection with the work of the Board of Agriculture more worthy of censure which they had not censured. He moved that the first paragraph of the Committee's report be not approved of, and that the Committee be reappointed, with power to arrange with public institutions or other bodies to conduct researches bearing on tuberculosis, for one year, at an expense not to exceed £250.

Dr Gibb seconded.

The Chairman asked Dr Gillespie whether he would not. now that the views of the Directors had been expressed, withdraw his motion and adopt Mr Wilson's.

Dr Gillespie, with the consent of his seconder, agreed to this.

Mr Andrew Hutcheson then moved that they vote no money at all for this purpose.

Mr R. Sinclair Scott seconded.

On a division being taken, 9 voted for Mr Hutcheson's amendment, and 21 for Mr Wilson's motion, which thereupon became the finding of the meeting.

The Babcock Test.

Mr M'Caig moved as follows, and the motion was unanimously agreed to: "That it be remitted to the Science Committee to consider reports as to the advisability of steps being taken to get the Babcock test for milk legalised by Government."

District Shows.

A minute of the Show Committee of 29th November was read, from which it appeared that 295 district shows had received grants during the past year to the total amount of £453, 19s., or £225 more than eight years ago, and £200 more than four years ago. For the coming year the Committee recommended grants amounting to about £479.

The Board then sat in private and elected judges for the Stirling Show.

MEETING OF DIRECTORS, 10th JANUARY 1900.

Present.—Vice-Presidents—The Earl of Moray; Sir Robert Menzies of Menzies, Bart. *Ordinary Directors*—Mr John Speir, Newton Farm; Mr George Dun, Woodmill; Mr David Wilson of Carbeth; Mr John M'Hutchen Dobbie, Campend; Mr John Macpherson Grant, yr. of Ballindalloch; Mr Walter Elliot, Hollybush; Mr Alex. Cross of Knockdon; Mr W. T. Malcolm, Dunmore Home Farm; Mr Jonathan Middleton, Clay of Allan; Mr E. Hedley Smith, B.L., Whittinghame; Mr William Clark, Netherlea; Mr W. S. Ferguson, Pictstonhill; Mr Alex. M. Gordon of Newton; Mr John Murray, Munnieston; Rev. John Gillespie, LL.D., Mouswald Manse. *Extraordinary Directors*—Mr Claud H. Hamilton of Dunmore Park; Mr John Edmond, Galamuir; Mr Andrew Hutcheson, Beechwood; Mr John Wilson, Chapelhill; Sir Ralph Anstruther of Balcaskie, Bart.; Mr George R. Glendinning, Hatton Mains; Mr John Cran, Kirkton; Mr Robert Paterson, Hill of Drip. *Treasurer*—Sir James H. Gibson-Craig of Riccarton, Bart. *Chemist*—Dr A. P. Aitken. *Auditor*—Mr William Home Cook, C.A. Mr Gordon of Newton, Chairman of Directors, presided.

Highland Cows.

On the question of the approval of the minutes of last meeting, Rev. Dr Gillespie called attention to the statement therein contained, that on the motion of Sir Robert Menzies it was resolved "that the class for Highland cows should be confined to cows in milk or with calf at foot." He thought that there should be some rider put to this, for, as it stood, a cow with calf at foot might be as dry as timber.

Sir Robert Menzies thought that it was clear enough. A cow in milk was a cow that was giving milk, and a cow with calf at foot was a cow that was being sucked.

The Secretary read the general rules for the Show dealing with the matter,

which laid down that "Highland cows must have had a calf within the nine months previous to the Show," as was the case with all other cows in milk.

Dr GILLESPIE said what Mr Macdonald had read was a change on the regulations, and gave them a way out of the difficulty.

The minutes were then approved of.

APPROPRIATE REMARKS.

The CHAIRMAN, as their Chairman, wished every member of the Board a very Happy New Year. It was rather late in the day, but still it was the usual thing to do at the first meeting of the year. There were one or two things that he would like to allude to briefly. During the past year death had carried away many of their members. He did not desire to allude to but two cases. One was the late General Wauchope, Niddrie, who had fallen in the service of his country, to which he devoted his life in a manner which was exemplary to every man in that room. There was another who was formerly a very useful member of the Board. He referred to the late Colonel Stirling of Kippendavie. He devoted much of his time to their interests, and he served the Board well and truly in his time. He moved that the Secretary be authorised to enter in the minutes expressions of regret in regard to the death of these two gentlemen.

This was agreed to.

FILLING VACANCIES.

It was agreed to recommend that Sir Archibald Buchan Hepburn of Smeaton, Bart., be elected an Ordinary Director in room of the late General Wauchope; that Sir Alan Seton Steuart of Touch, Bart., be elected an Ordinary Director in room of Mr Stirling of Keir, resigned; and that Captain Graham Stirling of Strowan be elected an Extraordinary Director in room of Sir Alan.

STIRLING SHOW, 1900.

Local Committee.—The minute of meeting of the Stirling Directors appointing the Local Committee was submitted.

Local Fund.—The SECRETARY stated that, with reference to the raising of a local fund, a meeting of the members of the Local Committee resident in the county of Dunbarton was held in Glasgow, with Mr Wilson in the chair. It was arranged to appoint local secretaries, and to issue circulars to landowners and others, with the view of raising funds towards the Stirling Show. These circulars would be issued in a week or ten days.

Prizes for Shires and Suffolks.—The Shows Committee had again before them on 10th January, for reconsideration, a letter from the Shire Horse Society suggesting that classes and prizes be provided at Stirling Show for Shire horses. There was also considered a letter from the secretary of the Suffolk Horse Society asking for classes for Suffolk horses, but holding forth a possibility of the Suffolk Society giving money for prizes if the classes were provided.

At their meeting of Committee on Wednesday, Mr JOHN WILSON moved that it is inexpedient for the Society to offer prizes for Shire horses.

Mr MALCOLM, Dunmore, seconded.

Mr FERGUSON moved that prizes be given, which was seconded by Mr GORDON.

Mr Wilson's motion was carried by 8 votes to 4.

It was unanimously agreed that prizes should not be offered for Suffolk horses.

The report was agreed to without remark.

Age of Fat Lambs.—Mr WALTER ELLIOT moved—"That the class for pens of five fat lambs be confined to lambs dropped after 1st January of the year of the Show."

Mr HUTCHESON seconded, and the motion was agreed to.

Special Prizes.—A number of special prizes were accepted.

Sir GEORGE MACPHERSON GRANT offered an exact replica of the Ballindalloch cup, gifted by the late Mr C. Macpherson Grant, for the best Aberdeen-Angus bull, and finally won by Sir George at the Edinburgh Show last July, the conditions to be as for the original cup.

The CHAIRMAN said that the only thing they could do was to accept this very handsome cup, and ask the Secretary to return their very best thanks to Sir George for it.

Agreed.

Forage.—It was agreed to accept the offer of Messrs Dewar Brothers, King's Park Farm, Stirling, to supply the fodder for the Show, on the usual conditions as to delivery and quality, prices to be as detailed in the offer and adjusted by the Committee.

Stewards.—The following were reappointed stewards : *Cattle*—Dr Gillespie. *Horses*—Mr W. S. Ferguson. *Sheep and Swine*—Mr W. Elliot. *Forage*—Mr D. Buttar. *Grand Stands*—Mr A. Hutcheson. *Implements*—Messrs Middleton and Glendinning.

The CHAIRMAN said it had been resolved to appoint an extra steward to be called Steward of Gates, and he would move that Mr M'Hutchen Dobbie be appointed to this office for Stirling Show.

Mr JOHN MACPHERSON GRANT seconded, and the motion was agreed to.

INVERNESS SHOW, 1901.

Local Fund.—The SECRETARY stated that the County Council of Morayshire had decided to take no further steps towards raising subscriptions.

Dr GILLESPIE said that he expected their members in that district would give liberal subscriptions, which would make up for any shortcomings on the part of Morayshire as a whole.

Mr CRAN said that in Sutherland the Duke of Sutherland was giving a very handsome subscription, and he thought the proprietors in Morayshire should do the same.

The matter then dropped.

A letter had been received from the County Clerk of Caithness stating that his Council had resolved that the voluntary assessment in aid of the local fund be collected by the County Collector along with the ordinary county rates.

ABORTION AND TUBERCULOSIS.

The SECRETARY reported that the Committee on Abortion amongst farm stock had not finished its deliberations, and no report could yet be made. The Committee on Tuberculosis had had a meeting, and had before them the report of the experiments carried on by the Agricultural Department of Aberdeen University last year. Looking to the value of that work, the Committee recommended that the Board vote the sum of £50 towards the expenses of the experiment.

Dr GILLESPIE, as Convener of the Committee, moved that the Agricultural Department of the University of Aberdeen be given this grant. The work conducted there was a most valuable one. They did it spontaneously. They did it when their funds were not too large, in fact at a time when some other institutions would not have agreed to embark on such an important matter. They did it, however, and he thought it was proper that a National Society like that should recognise the spirited services of the Aberdeen University. He also moved that Dr Shirra Gibb be added to the Committee.

Mr CROSS seconded.

Mr WILSON asked if any part of this motion was in opposition to the determination of that Board at last meeting.

Dr GILLESPIE—This is for work done in the past.

The motion was unanimously agreed to.

FORESTRY AT GLASGOW EXHIBITION.

Sir ROBERT MENZIES suggested that the Society should use its influence in an endeavour to obtain an adequate representation of forestry at the Glasgow Exhibition of 1901.

Sir RALPH ANSTRUTHER seconded, and the Secretary was instructed to write accordingly to the Manager of the Exhibition.

POLLED CATTLE GOLD MEDAL.

A minute of Committee of 10th January on the award of the gold medal of the Polled Cattle Society at Edinburgh Show in 1899 was submitted.

The CHAIRMAN said that after carefully considering all the correspondence and the documents connected with the matter, the Committee had come to the unanimous conclusion that they had no alternative but to hand over the medal to Sir George Macpherson Grant, to whom it was awarded at the Edinburgh Show.

Agreed.

NEXT MEETING.

It was agreed that next meeting be held on 31st January, and that there be no meeting in February.

MEETING OF DIRECTORS, 31st JANUARY 1900.

Present.—Vice-Presidents—The Earl of Moray; Sir Robert Menzies of Menzies, Bart. *Ordinary Directors*—Mr John Speir, Newton Farm; Mr George Dun, Woodmill; Mr David Wilson of Carbeth; Mr John M'Hutchen Dobbie, Campend; Mr Alexander Cross of Knockdon; Mr W. T. Malcolm, Dunmore Home Farm; Mr William Duthie, Tarves; Mr John M'Caig, Challoch; Mr Jonathan Middleton, Clay of Allan; Mr E. Hedley Smith, B.L., Whittinghame; Mr W. S. Ferguson, Pictstonhill; Mr R. Shirra Gibb, Boon; Mr R. W. B. Jardine, yr. of Castlemilk; Mr Alexander M. Gordon of Newton (Chairman). *Extraordinary Directors*—Sir Alan H. Seton Steuart of Touch, Bart.; Mr William Drysdale, King o' Muirs; Mr John Edmond, Galamuir; Mr John M. Martin, Edinburgh; Mr Andrew Hutcheson, Beechwood; Mr John Wilson, Chapelhill; Mr Wellwood Maxwell of Kirkennan; Mr John Cran, Kirkton. *Hon. Treasurer*—Sir James H. Gibson-Craig of Riccarton, Bart. *Chemist*—Dr A. P. Aitken. *Auditor*—Mr William Home Cook, C.A. Mr A. M Gordon in the chair.

The CHAIRMAN intimated that he had to apologise for the absence of his friend Mr Lumsden of Balmedie, who, he was sorry to say, was seriously ill.

VOTES OF CONDOLENCE.

The CHAIRMAN referred sympathetically to the death of the Marquis of Lothian, who had been President of the Society in the year 1881, and served as a Director. He took a great interest in agricultural affairs. It was agreed to record an expression of regret in the minutes, and send a copy to Lord Lothian's representatives.

Minutes of meeting of Directors on 10th January were read, approved of, and signed by the Chairman.

STIRLING SHOW, 1900.

A letter was read from the Town Clerk of Stirling intimating a contribution of £100 to the local fund.

Mr Howatson of Glenbuck offered a special prize of £10 for the best five Blackface tups, any age, bred by exhibitor and never out of breeder's possession, shown in classes 76 and 77. The prize was accepted with thanks.

INVERNESS SHOW, 1901.

Mr JONATHAN MIDDLETON moved that the Inverness Show of 1901 should begin on the third Tuesday of July, and continue as usual until the Friday of that week—the dates being the 16th, 17th, 18th, and 19th.

Mr C. M. CAMERON, Balnakyle, seconded, and the motion was unanimously agreed to.

SHOW OF 1902.

The CHAIRMAN moved that the Show of 1902 be held at Aberdeen, provided satisfactory financial and other arrangements can be made with the local parties concerned.

Mr DUTHIE seconded, and the motion was adopted, and the Secretary instructed to make the usual preliminary arrangements.

SCIENCE COMMITTEE.

The report of this committee meeting, held the same day, was submitted and adopted. Regarding the Babcock test, the Committee had not come to a definite finding, and they asked for a continuation of the remit in order to receive fuller information. The Committee drew up an adjusted scheme of unit values of manures for the current season, and the schedule which had been arranged would be circulated in the usual way.

ABORTION COMMITTEE.

On behalf of this Committee it was intimated that they had met that morning. The Committee recommended that they be continued, that Principal Williams be asked to prepare for publication a memorandum giving information as to the cause of abortion and as to the most useful means of prevention and remedy, that breeders be

invited to report outbreaks to the Society, so that they may be investigated, and that for this purpose a sum of £50 be placed at the disposal of the Committee.

Mr SPEIR moved the adoption of this report, which Mr FERGUSON seconded, and it was agreed to unanimously.

CABBAGE AS A FARM CROP.

The SECRETARY reported that a number of papers had been sent in for Mr Gillies's prize of £10 for the best essay on the subject of "Cabbage as a Farm Crop." The readers reported that, although these papers contained useful information, none of them dealt with the question in a sufficiently exhaustive manner, and they could not recommend that the prize be awarded. With the approval of Mr Gillies, it was agreed to again offer it, in the hope that some essay worthy of the subject should be sent in. Those who have sent in these essays will receive their manuscript back on application to the Secretary, who meantime, of course, is not aware of the identity of the writers.

Approved.

GRANT.

It was agreed to recommend the renewal of the grant of £50 to the Lecturer on Forestry in Edinburgh University.

THE PENICUIK EXPERIMENTS.

The CHAIRMAN said that it would be in the recollection of the Board that a Committee had during last spring visited Professor Cossar Ewart's place to report on the experiments which he was conducting on the crossing of certain animals, and in the elucidation of certain problems in stock-rearing. As the result of that visit, Professor Ewart had made an interesting exhibition of his hybrids at the Highland Show at Edinburgh. The Directors had for some time before them the propriety of making some grant to Professor Ewart in aid of his work, and a letter had been received from Sir John Gilmour urging the Board to make a donation of £200 to Professor Ewart to aid him in the continuance of these experiments. In his letter Sir John said he hoped they would move in this direction; and he also indicated that he intended personally to give the Professor a donation of £50 in aid of his interesting work. He moved that a donation of £200 be given Professor Cossar Ewart to aid in the completion of the interesting experiments on which he has been

Mr W. S. FERGUSON, Pictstonhill, seconded, and said that in the meantime it was perhaps premature to say whether the Professor's experiments would be of much practical use, but they were certainly extremely interesting, and they were designed to have a practical issue. It was proper for them to recognise work of that kind.

Mr DAVID WILSON was a little doubtful of making a grant of the kind without attaching some condition to it. Had they been private individuals they might do so, but they were acting for the public, and their duty was to see that value was got for the public, and in voting away money they would have to make some stipulation.

The minute of the Committee which had visited Penicuik was then read, and the motion was agreed to.

PROCEEDINGS AT GENERAL MEETINGS.

GENERAL MEETING, 7TH JUNE 1899.

Sir JOHN GILMOUR of Montrave, Bart., in the chair.

The SECRETARY intimated that 328 candidates for election as members of the Society had been intimated, and these were duly admitted.

OFFICE-BEARERS.

The Office-Bearers were appointed as follows: *President*—Lord Balfour of Burleigh. *Vice-Presidents*—The Duke of Montrose, the Earl of Moray, Colonel Murray of Polmaise, and Sir Robert Menzies of Menzies, Bart. *Ordinary Directors*—Major-General Wauchope of Niddrie, C.B.; Mr R. Sinclair Scott, Burnside; Mr John Murray, Munnieston; Sir Robert D. Moncreiffe of Moncreiffe, Bart.; Mr C. H. Scott Plummer of Sunderland Hall; Rev. John Gillespie, LL.D., Mouswald Manse; Mr John Marr, Cairnbrogie; and Mr C. M. Cameron, Balnakyle. *Extraordinary Directors*—Colonel Home-Drummond of Blair-Drummond; Mr Archibald Forrest, Provost of Stirling; Mr C. H. Hamilton of Dunmore Park; Mr John J. Moubray of Naemoor; Mr Robert C. Mackenzie of Edenbarnet; Sir Alan H. Seton Steuart of Touch, Bart.; Mr John Craig, Innergeldie; Mr William Drysdale, King o' Muir; Mr John Edmond, Galamuir; Mr Parlan Macfarlan, Faslane; Sir Ralph Anstruther of Balcaskie, Bart.; Mr John Cran, Kirkton; Mr G. R. Glendenning, Hatton Mains; Mr Robert Paterson, Hill of Drip; Mr James Lockhart, Mains of Airies; Mr Ford, Fentonbarns; Mr John M. Martin, Edinburgh; Mr Andrew Hutcheson, Perth; Mr John Wilson, Chapelhill; and Mr Wellwood Maxwell of Kirkennan.

EDINBURGH SHOW, 1899.

Sir JAMES H. GIBSON-CRAIG, Convener of the Local Committee, reported that the arrangements for the Show at Edinburgh on Tuesday, 4th July, and three following days, are well advanced. The entries closed last Wednesday, and it is found that the display of live stock will be the largest in the history of the Society. The total number of entries exceed that at the Centenary Show in 1884 by over 100, the figures being about 2025 this year and 1918 in 1884. The show of horses will be much the largest the Society has ever had, the entries exceeding those at the Centenary Show by about 60. It was gratifying that the efforts to bring out a large muster of hunting horses had met with success. Thanks to the liberality of hunting men in Scotland, the prizes offered by the Society for Hunters were supplemented by no less than £427, as compared with £445 in the centenary year. The result is that in the nine classes for hunting stock there are nearly 170 entries; while in the five classes of "made" Hunters, shown in saddle—the most attractive classes to the general public—there are over 100 entries, as compared with 17 at Kelso last year, and 59 at the Centenary Show. Another record has been created by the applications for space in the implement department, about 7000 feet having been applied for. He was glad to learn on all hands that great and increasing interest was being manifested

in the visit of H.R.H. the Prince of Wales. His Royal Highness will visit the Show on Wednesday and Thursday, 5th and 6th July, the second and third days of the Show, and he was happy to say that his Royal Highness had agreed to present the champion gold medals to the winners in the parade-ring on the Wednesday forenoon. The prospects of a brilliantly successful Show were encouraging, and he was hopeful that with favourable weather still more fresh records would be created before the close of the Show.

Stirling Show, 1900.

Sir James H. Gibson-Craig reported that satisfactory progress was being made with the arrangements for the Show of next year, to be held at Stirling. The Commissioners of Woods and Forests had given their sanction to the Show being held in the King's Park, and it was hoped that arrangements would speedily be made with the other interested parties. The prospects of the local fund were encouraging. The counties of Stirling and Perth would contribute by voluntary assessment, and it was hoped Dumbartonshire and Clackmannan might see their way to follow that example.

Inverness Show.

Sir James H. Gibson-Craig intimated the arrangements made for the proposed Show at Inverness in 1901.

Examination in Agriculture.

Rev. Dr Gillespie moved the adoption of the following resolutions, adopted at a meeting of the Council on Education on 1st March 1899, and approved at a meeting of the Board of Directors on 5th April 1899: "(1) That the Council approve of the proposed joint examination for a national diploma in Agriculture, to be granted jointly by the Royal Agricultural Society of England and the Highland and Agricultural Society of Scotland. (2) That this joint examination take the place of the examination in Agriculture now held annually by the Highland and Agricultural Society. (3) That the Council approve of the management of the joint examination being placed in the hands of a joint board, to be elected by the Royal Agricultural Society of England and the Highland and Agricultural Society of Scotland, the Directors of the latter Society to be authorised to elect the Scotch members of the joint board. (4) That with the view of these resolutions being carried into effect the existing by-laws Nos. 2, 3, 4, 5, 6, 7, and 8 be cancelled, and the following bylaw adopted in their place, viz.: 'That in view of the Royal Agricultural Society of England and the Highland and Agricultural Society of Scotland having arranged to establish a joint examination for a national diploma in Agriculture, the Council be authorised to discontinue the Highland and Agricultural Society's examination in Agriculture.' "

Sir Ralph Anstruther seconded, and the motion was agreed to.

Regulations for Clipping Blackface Sheep.

Sir Robert Menzies, Bart., moved—"That it destroys the hardy character of the Blackface breed of sheep clipping them on the 1st of January and keeping them confined in a house for several months, and that they should not be shorn till the 15th of May, or such other date as the general meeting of the Society may decide upon."

In speaking to the resolution, Sir Robert said he believed there was great dissatisfaction in Scotland at the present time with regard to these regulations. They were clipped now by rule of the Society after the 1st of January, and the consequence was that, in order to steal a march upon opponents, every man clipped his sheep as soon as he could, the result being that the sheep suffered from the cold. The Society was in the wrong, and ought to fix upon a more natural date. He would have suggested the 15th of May, but that would not suit all places, and he would therefore leave the matter to the Society.

The Chairman called for a seconder, but none appearing, the motion fell to the ground.

Chemical Department.

Mr David Wilson reported on behalf of the Science Committee. He stated that the feeding experiment with six score of sheep, conducted by Mr M'Caig, Challoch, Leswalt, that was intimated at the general meeting in January, has now been brought to a close in a very successful manner. The object of the experiment, which lasted over five months, was to demonstrate the relative value of various concentrated fodders when given to fattening sheep folded on turnips during the winter. The fodders employed were dried grains, linseed-cake, oats, and a mixture of these three, and lastly, Indian corn. When the experiment had become fairly established, each lot of

twenty sheep received these three fodders daily in quantities of equal money value. Full details of the experiment will be published in the next volume of the 'Transactions,' but the main result may be stated here with advantage. The lot that made the greatest progress was that fed on dried grains. It was the bulkiest of the fodders used, and it is interesting to observe that this lot also consumed the most turnips. Second came the lot fed on Indian corn; third, that fed on linseed-cake; fourth, the lot fed on the mixture; and fifth, that fed on oats. The lot fed on grains gained fully 2 lb. per week, while that fed on oats gained less than 1½ lb. per week. This experiment excited a great deal of interest in the district, and was visited by many stock-owners. The slag experiment intimated at last general meeting is now in progress. The Directors were asked to furnish the names of those within their districts who would undertake the experiment, with the gratifying result that it is now laid down upon twenty-six farms over the length and breadth of the country. The slag was applied in the spring, and along with it kainit and lime, upon about an acre of grass land, chiefly pasture. It is intended to continue the experiment, applying the same manures in the same way either on the same or on different fields in autumn. The manures are supplied free of cost and carriage paid to members of the Society who are willing to co-operate. The rotation experiment with farmyard manure at Boon is now in its second year.

Botanical Report.

Mr A. N. M'Alpine, the Society's Botanist, reported as follows: During this season I have tested about one hundred samples of grass and clover seeds. The seeds were for the most part very pure—rarely less than 95 per cent purity. Some samples, more especially of turnip-seeds, had the strong odour commonly spoken of as musty-fusty. It is easy to render the cause of this characteristic smell visible to the eye, and to say quite definitely that the seed is musty. If a hundred seeds of a good sample, free from smell, are placed in a test-tube three-quarters full of sterile water—*i.e.*, boiled water—and alongside of this the sample which is being examined, and under exactly similar conditions, it will be found in twenty-four hours or so that the tube which contains musty seed will show white threads of fungus spawn growing up from the seed, ramifying through the fluid, and rendering the clear water more or less turbid. This is a rough but very convenient method of testing musty seed, and can be easily carried out by any farmer. The germinating power of the seeds tested, taken on the whole, was fairly high, in some cases reaching 99 and 100 per cent, and rarely falling below 80 per cent. In connection with the method of germination, I would point out that I have entirely discarded the use of all felts and woollen materials from my germinator. This leads to a very distinct gain, since the substitution of coarse linen towelling for felt almost entirely prevents fungus growths from interfering with the germination of the seed samples set in blotting-paper. The blotting-paper used is boiled in water to render it sterile. Before setting the seeds in the germinator they are washed and soaked for twelve or twenty-four hours in water. If these precautions are taken the seeds are, I consider, placed under the best circumstances for displaying their real and intrinsic powers of growth, which is the object of the germinating test.

Agricultural Education.

Rev. Dr Gillespie gave in the report as to the Society's examination in Agriculture, held last April, which showed that thirty-one candidates came forward. Nine obtained the diploma, and ten the certificate. Dr Gillespie also announced that the £10 given in prizes to the class of Agriculture in the University of Edinburgh had this year been awarded equally to Messrs E. J. Mackenzie, John o' Groats; J. M. Rankin, Edinburgh; D. S. Rabagliati, Bradford; and Colin Story, Edinburgh.

Forestry Department.

Sir Robert Menzies reported that the Forestry examinations were held from the 10th to the 14th April, when five candidates presented themselves, with the result that two obtained the first-class certificate and one the second-class certificate.

This was all the business.

GENERAL MEETING IN THE SHOWYARD AT EDINBURGH, 5TH JULY 1899.

The usual meeting of members of the Society was held in the Pavilion. The great interest manifested in the royal visit resulted in the meeting being perhaps the largest there has yet been held in the showyard, about 1500 members being present. The Prince was received with great enthusiasm. His Royal Highness, as President of the Society, took the chair. Among others accompanying his Royal Highness to the platform were the Duke of Buccleuch, the Duke of Atholl, the Duke of Montrose, the Earl of Rosebery, the Earl of Elgin, the Earl of Hopetoun, the Earl of Mansfield, Lord Balfour of Burleigh, Mr Walter Long, M.P.; Sir John Gilmour, the Master of Polwarth, Sir James Gibson-Graig, Sir Robert Menzies, Sir Ralph Anstruther, Sir Jacob Wilson, Sir Archibald Buchan-Hepburn, Sir Robert Moncreiffe, Lord Provost Mitchell Thomson, Mr Maxwell of Munches, the Rev. Dr Gillespie of Mouswald, the Rev. Dr Scott of St George's, Edinburgh; Mr Howatson of Glenbuck, Mr W. B. Jardine, yr. of Castlemilk; Major Gordon Gilmour of Liberton, Mr A. M. Gordon of Newton, Captain Clayhills Henderson, Invergowrie; Mr James Hope, East Barns; Mr J. M. Martin, Mr Andrew Hutcheson, Beechwood; Mr John Macpherson Grant, yr. of Ballindalloch; Mr John M'Hutchen Dobbie, Campend; and Mr Lockhart, Mains of Airies. The Scottish Chamber of Agriculture, which had prepared an address for presentation to his Royal Highness, was represented by Sir Herbert Maxwell, honorary president; Mr John Speir, Newton, president; Mr Constable and Mr David Cunningham, vice-presidents; Mr Andrew Glendinning, Mr George R. Prentice, Mr R. R. Prentice, and the secretary, Mr Isaac Connell.

Mr A. M. GORDON moved a vote of thanks to Lord Provost Mitchell Thomson, the Magistrates, and Town Council for the great assistance they had rendered to the Directors, the Secretary, and the Local Committee of the Society in organising and promoting this Show, and especially for the handsome donation of £400 towards the funds of the Show.

Sir ROBERT D. MONCREIFFE, Bart., seconded.

HIS ROYAL HIGHNESS having put the resolution to the meeting, declared it unanimously carried amid cheers.

The Rev. Dr GILLESPIE, Mouswald, moved a vote of thanks to the subscribers to the local fund in aid of the Show and the donors of special prizes for the liberal support they had given to the Society. In addition to the usual prizes given by the Society itself, the owners of land and tenant-farmers in the particular district which they visited for the year were most liberal in providing them with a local fund. On this occasion Edinburgh and the Lothians had not been behind any other district. Noblemen and gentlemen who were friends of the Society, and patrons of the particular breeds which they exhibited in Scotland, did them the favour of supplying them with special prizes; and on no occasion in the history of the Society, except the Centenary Show in 1884, had they been so liberally treated as at this Show. He had great honour in moving the resolution.

Mr ANDREW HUTCHESON, Beechwood, seconded the resolution, which was put to the meeting by his Royal Highness and agreed to unanimously.

The MASTER OF POLWARTH moved that the thanks of the Society be given to Sir James Gibson-Craig, the Convener, and to the other members of the Local Committee, for the assistance they had rendered in carrying out the arrangements in connection with the Show.

Mr JOHN MACPHERSON GRANT, yr. of Ballindalloch, seconded the motion, which on being put by his Royal Highness to the meeting was adopted.

A meeting was then held in promotion of the interests of the Scottish Agricultural Benevolent Institution, the Prince of Wales still occupying the chair. At the close

Sir JOHN GILMOUR said the duty that fell to him was a very pleasant one, and a very high honour. It was to propose a hearty vote of thanks to their Royal President of this year. He need not, he was sure, remind the meeting with what feelings of deep satisfaction the members of the Highland and Agricultural Society of Scotland received the intimation that the Prince of Wales had graciously accepted the post of President for this year. But they felt not only was his Royal Highness honouring that Society, but he was honouring agriculture in broad Scotland too. They knew very well that posts were accepted, but they also knew that duties were sometimes unfulfilled. Far otherwise was it when his Royal Highness accepted a post, or any other member of the Royal Family. The duties of these posts were amply and well fulfilled to the letter, and he thought that the Prince's presence that day had brought joy and happiness to thousands of loyal Scottish men and women, who would return to their homes in their northern land proud of having been able to say that they had

seen the Prince—a Prince who followed so well and fully in the footsteps of her Gracious Majesty, our beloved Queen, and who had so thoroughly gained for himself the title, "The friend of the farmer." He need only say in so graciously presiding over the meeting held on behalf of the Scottish Agricultural Benevolent Institution, his Royal Highness had lent a strong and able hand in a work which had already in its short life brought a ray of happiness into a few of their Scottish homes tenanted by those who had fallen in the fight; and it would be from this day onward a great duty to see that not only a few homes would be brightened, but that they would do their best to lighten the burden of the declining years of those who had been unfortunate and yet were deserving. They all remembered what pleasure it gave them when his Royal Highness the Duke of York did them the honour of presiding over them at the Aberdeen Show. They might now think that they had reached the height of their ambition when they had his Royal Highness the Prince of Wales himself as their President at their great Show in Edinburgh. As they looked back with pleasure to the presence of the Duke of York, so they would remember that day and look forward to his accepting the position on some future occasion. He concluded by moving formally a vote of thanks to his Royal Highness for accepting the presidency and presiding at that meeting.

Lord Provost MITCHELL THOMSON, in seconding the vote of thanks, said that on behalf of the city of Edinburgh, and of his colleagues in the Town Council, he assured them that they felt it not only a duty but a great pleasure to do anything they could to promote the interests of the Society.

The PRINCE OF WALES, in responding to the vote of thanks, said: My Lords and gentlemen—and, may I say, brother agriculturists?—I am deeply sensible of the kind terms in which Sir John Gilmour has proposed the vote of thanks to me. I am also most grateful for this cordial reception and the kind words which fell from the Lord Provost of this great city. I need hardly tell you, as I mentioned to-day already, the great pleasure it gives me to be your President at this great Show at Edinburgh at the close of the present century. One has often heard of walking in one's father's footsteps. Well, in this instance, gentlemen, I am walking in my son's footsteps. In 1893 you kindly elected him to be President for the year. He had a good reason for not coming, for he married a wife and could not come. But he came the following year, and presided at your Show at Aberdeen. I shall always look back to this visit with the greatest pleasure and satisfaction, and for the kind and cordial way in which you received me. I hope before I leave to-morrow to have had an ample opportunity of seeing all that is of interest in this Show. I am glad to think that it has reached already the one hundred and fifteenth anniversary of its existence. At the Centenary Show, I believe, there were the largest exhibits of horses, sheep, cattle, and swine, amounting to 1536. I think we have done very well this year when we have exhibits in these classes, as I believe, to the number of 1417. I can only allude for a moment to the Scottish Agricultural Benevolent Institution. It has only been in existence for two years. From what fell from the lips of Lord Mansfield, it is indeed an institution, though young, which is, I think, well worthy of your support. Anything that can be done to alleviate the suffering of the agricultural class, male and female, deserves our sympathy and philanthropic efforts. I needly hardly say it will give me great pleasure on this occasion, if I may do so, to give a donation of £50 towards it. I shall not keep you longer, as I think on these occasions that brevity should be the soul of wit; but I thank you once more for your kind reception, and I can assure you how proud I have been to take the chair to-day.

As the meeting separated, Sir JOHN GILMOUR called for three cheers for the Prince, and a member called for three cheers for the Princess of Wales, which were heartily given.

ANNIVERSARY GENERAL MEETING, 31ST JANUARY 1900.

The EARL OF MORAY in the chair.

The SECRETARY intimated letters of apology from Lord Balfour of Burleigh and others.

The CHAIRMAN referred in sympathetic terms to blanks that had been made in the ranks of Scottish agriculturists by death, and especially by that of the Marquis of Lothian.

OFFICE-BEARERS.

The Directors recommended that Sir Archibald Buchan Hepburn of Smeaton,

Bart., be elected an Ordinary Director in room of the late General Wauchope of Niddrie, C.B.; that Sir Alan Seton Steuart of Touch, Bart., be elected an Ordinary Director in room of Mr Archibald Stirling of Keir, resigned; and that Captain C. Home Graham-Stirling of Strowan be elected an Extraordinary Director for the current year in room of Sir Alan Seton Steuart.

This was agreed to.

Finance.

Sir James H. Gibson-Craig, Treasurer, submitted the Accounts for the year to 30th November last. The year had been a record one all through the Society's finances. The Edinburgh Show had left the record profit of over £3900, while the receipts for members' subscriptions, life and annual together, were the highest in the history of the Society by about £300. This was accounted for chiefly by the large influx of new members. He proposed to look at the financial position of the Society during the last twenty years. The last twenty Shows had realised a profit of £7243, but that was due entirely to the success of three Shows during the last circuit—namely, 1896, Perth, £2512; 1897, Glasgow, £2021; and 1899, Edinburgh, £3911, being a total of £8444 profit on these three Shows alone. This was gratifying, but they had to bear in mind on the top of this prosperity that they had in view some lean years. A further point to be considered was the fact that this profit was entirely due to the assistance received from local subscriptions, these amounting to £23,202, besides nine free sites. If they had not had that support they would have lost over £17,000 on these twenty Shows, which was just about the amount which they had received from annual subscribers during the same period, the net figures being £17,150. Out of the profits recently made they had been able to add to their investments to the extent of £4500, and their invested capital now stood at £91,586. In addition to increasing their investments, as mentioned, they had also retained in bank, to meet possible charges during the next few years, a substantial sum which they judged would be sufficient for their purpose. The Society had been open to considerable misrepresentation regarding their financial position. Many had a very small idea of how absolutely dependent they were on their income from invested funds. From annual subscribers they had received during the twenty years, as he had said, £17,150, and from life subscribers during that period £16,820, or, in all, very nearly £34,000. The interest on their invested capital during the same period was £53,250. They had expended during that period £81,000. Where would the Society have been without its invested funds? Of this, £24,863 had been in one form or other returned to members. The 'Transactions' had during the twenty years cost £12,112; district societies got £9148; and in special grants and donations they paid away £3605, which included the £1000 given to the Scottish Agricultural Benevolent Institution. Altogether, in round figures the Society had given back to its members £25,000 in one form or another, and received from them £34,000. They had annually paid back to the members in one form or other £1200. The average expenditure per annum during the 'eighties was £4500, and during the 'nineties £3600. This difference was partly due to a decrease in salaries, but chiefly to their having given up the expensive amusement which they carried on at Pumpherston. These figures showed clearly how very largely they were dependent on the interest from their invested funds for keeping things going. That interest had very seriously decreased during the time referred to. In 1880 the Society had invested funds to the amount of £64,400, yielding an annual interest of £2728, or at the rate of £4, 4s. 9d. per cent. In 1898 the invested funds amounted to £88,118, and the interest to £2870. So that while the face value of their investments had during that period increased by £23,718, their income from that source had only increased by £142, or in other words, there was a fall of 19s. 7d. per cent in the rate of interest. The average rate of interest derived from their existing investments was 3¼ per cent, but the £4500 which they had invested during the year only made 2¾ per cent. The rate of interest was likely to decrease still further, so that an invested capital of £100,000 will be required to bring the Society the same income which the £64,000 gave it in 1880. The lesson of all this was very obvious. One of three things must happen. They must either go on adding to their invested funds as opportunity arose, or lessen the usefulness of the Society, or increase the charges to members. He was sure they would all be of one mind, that the most satisfactory course would be to go on adding to the invested funds from time to time as they were able, so that they might not have a less income than they had in 1880 from invested funds. They should also bear in mind that the increase in the membership meant a liability to 50 per cent more members than they had in 1880.

Mr A. M. Gordon moved a vote of thanks to Sir James for the clear statement he had made of their financial position.

The motion was adopted.

ARGYLL NAVAL FUND.

Sir ROBERT MENZIES submitted the Accounts of the Argyll Naval Fund for 1898-99, which showed that the income for the year amounted to £217, 11s. 2d., while the expenditure was £200, 11s. 6d., made up by a grant of £40 to each of five naval cadets, and 11s. 6d. for printing.

EDINBURGH SHOW, 1899.

Sir JAMES H. GIBSON-CRAIG reported upon the Edinburgh Show of last year. It was unquestionably the most successful Show in the history of the Society. Taking all sections into account, the display of stock and implements was the largest ever seen in a Highland Show, and in regard to merit it had certainly never been excelled. In the live stock section the most notable feature was the grand collection of hunting horses, by far the finest ever seen in this country. No event in the long history of the Society had given greater gratification to the agriculturists of Scotland than the visit of his Royal Highness the Prince of Wales to the Edinburgh Highland Show of 1899, and it was undoubted that the good influence of that visit would be felt for many a day to come. His Royal Highness had all along evinced the keenest interest in the success of the Show, and in furthering that end had in the most gracious manner co-operated with the officials of the Society. The attendance of the public was unprecedented in Scotland, over 100,000 having entered the showyard in the course of the four days. The Show was well supported locally, the district fund in aid of the expenses of the Show amounting to £1112. Towards this sum the town of Edinburgh contributed £420, the county of Mid-Lothian £417, and East Lothian £240. The drawings at the gates and grand stands amounted to no less than £10,231, while the Show left the Society with the handsome profit of over £3900—a record profit in the history of the Society.

STIRLING SHOW, 1900.

Mr D. WILSON, Convener of the Local Committee, reported that the arrangements are well advanced for the Show of this year, to be held at Stirling on Tuesday, 17th of July, and three following days. A capital site has been obtained on the King's Park, adjoining the town of Stirling. The railway companies are making progress with the platforms for the new railway station, and although little or nothing could be done to the buildings, it was hoped that the main portion of the platforms would be ready for use in connection with the Show. He was glad to say there were prospects of a satisfactory local fund being obtained. The town of Stirling had resolved to contribute a sum of £100, the counties of Stirling, Perth, and Clackmannan were raising sums by means of voluntary assessments on owners of lands and heritages, while in the county of Dumbarton subscriptions were being collected by a Local Committee. The prize-list would be found to be a very liberal one. The Society gave about £630 more in prizes than at the Stirling Show in 1891, while the list of prizes was much enhanced by private donors.

INVERNESS SHOW, 1901.

Sir JAMES H. GIBSON-CRAIG reported that the arrangements for the Show of 1901, to be held at Inverness, were progressing satisfactorily. The County Councils of Inverness, Ross and Cromarty, Nairn and Caithness, had resolved to raise contributions to the local fund by voluntary assessments, while steps were being taken to collect subscriptions in the counties of Elgin and Sutherland. The town of Inverness had given a free site and a grant of 50 guineas, while the Inverness Farmers' Society had voted a contribution of £75, and the Easter and Wester Ross Farmers' Clubs and the Black Isle Farmers' Society together no less than £100.

SHOW OF 1902.

Mr GORDON moved that, provided satisfactory financial and other arrangements can be made, the Show of 1902 be held at Aberdeen.

Mr DUTHIE seconded, and the motion was unanimously agreed to.

EXAMINATION IN AGRICULTURE.

The resolutions (page 484) adopted at a meeting of the Council on Education on 1st March 1899, and approved at a meeting of the Board of Directors on 5th April 1899, and at the general meeting on 7th June 1899, were put from the chair and agreed to.

DISTRICT SHOWS.

Mr MARTIN submitted the report on district competitions, showing that in 1899 295 districts participated in grants of money and medals. The total expenditure under

this head amounted to £454. For the current year the Directors proposed the following grants: (1) Under section 1, eighteen districts for grants of £12 each for cattle, horses, and sheep, and five districts in intermediate competition with a grant of three silver medals to each; (2) under section 2, six districts for grants of £15 each for stallions; (3) twenty-five districts, two silver medals each; (4) ploughing competitions, 210 medals; (5) cottages and gardens, eighteen districts, two medals each. The Directors also recommended the following special grants: £40 to the Highland Home Industries and Arts Association; £20 to the Kilmarnock Dairy Produce Show; £5 to the Shetland Agricultural Society; and £3 each to Orkney, East Mainland, and West Mainland (Orkney) Agricultural Societies. The total sum recommended to be given in 1900 amounts to £480, 17s. 9d.

Dr Gibb seconded, and it was agreed to.

Chemical Department.

Mr David Wilson, Convener of the Science Committee, reported that the experiments begun last winter to test the manurial value of basic slag when applied as a top-dressing to pasture, and especially to hill pasture, not only by itself, but also in conjunction with kainit and lime, are still in progress. The reports which have already been received show, as was expected, great diversity, and a second instalment of reports will be received during the summer. These experiments are being conducted on upwards of thirty farms in widely different parts of the country, and on most of them a second set of manures has been applied alongside of the former ones, but in November, whereby the relative advantages of spring and autumn manuring will be ascertained. The sheep-feeding experiment carried on by Mr M'Caig in the Rhins of Galloway last winter, the report of which will appear in the forthcoming volume of the 'Transactions,' has elicited much useful information, and a somewhat similar experiment on a large scale is now proceeding, under the care of Mr William Hutcheson, on the farm of Airleywight, Bankfoot, Perthshire. It began early in December, and the results, so far as the experiment has gone on, give promise of information of interest and value to sheep-feeders. Agreed.

Forestry.

Sir Robert Menzies moved that the grant of £50 to the Lecturer on Forestry in the Edinburgh University be continued for the current year. Sir Robert also reported that the examination for the current year for the Society's certificates in Forestry would be held at the Society's chambers on the 10th, 11th, and 12th of April next.

Mr Gordon seconded, and the motion was agreed to.

Education.

Mr Ferguson reported that at the examination held at the Dairy Institute, Kilmarnock, in the first week of October last, for the national diploma in Dairying, there were nine candidates, of whom five obtained the diploma. The next examination in Scotland will take place, as last year, at the Dairy School, Kilmarnock, on Monday, 1st October, and four following days. The Directors recommended that the grant of £60 hitherto paid to the Scottish Dairy Institute, Kilmarnock, be given for the current year to the Glasgow and West of Scotland Agricultural College in aid of the expenses of conducting the Kilmarnock Dairy School.

Mr Ferguson also reported that the regulations and syllabus for the joint examination by the Royal Agricultural Society and the Highland and Agricultural Society for the national diploma in Agriculture were now finally adjusted, and that the first examination would be held at the Yorkshire College, Leeds, on the 30th April, and 1st, 2nd, 3rd, and 4th May next.

The last examination for the Society's diploma in Agriculture, but only for those candidates who previously failed in two of the subjects, would be held on Thursday, 12th April next, at the Society's chambers.

Mr John Edmond seconded, and the report was agreed to unanimously.

Publications.

Mr John Wilson reported that the volume of 'Transactions' for the current year was now being printed, and would be issued in March, arrangements having been made to send a copy to every member resident in the United Kingdom. He expressed the hope that not merely members of the Society, but also a large number of the outside public, would purchase this copy of the 'Transactions,' which not only marked record year, but also was full of most useful information.

A vote of thanks to the Chairman concluded the proceedings.

APPENDIX

PREMIUMS

OFFERED BY

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND IN 1900

CONTENTS.

GENERAL NOTICE.

THE HIGHLAND SOCIETY was instituted in the year 1784, and incorporated by Royal Charter in 1787. Its operation was at first limited to matters connected with the improvement of the Highlands of Scotland; but the supervision of certain departments, proper to that part of the country, having been subsequently committed to special Boards of Management, several of the earlier objects contemplated by the Society were abandoned, while the progress of agriculture led to the adoption of others of a more general character. The exertions of the Society were thus early extended to the whole of Scotland, and have since been continuously directed to the promotion of the science and practice of agriculture in all its branches.

In accordance with this more enlarged sphere of action, the original title of the Society was altered, under a Royal Charter, in 1834, to THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

The leading purposes of the Institution are set forth in the following pages, where it will be found that Premiums are offered for Reports on almost every subject connected with the cultivation of the soil; the rearing and feeding of stock; the management of the dairy; the improvement of agricultural machinery and implements; the growth of timber; the extension of cottage accommodation; the application of chemical science; and the dissemination of veterinary information.

Among the more important measures which have been effected by the Society are—

1. Agricultural Meetings and General Shows of Stock, Implements, &c., held in the principal towns of Scotland, at which exhibitors from all parts of the United Kingdom are allowed to compete.

2. A system of District Shows instituted for the purpose of improving the breeds of Stock most suitable for different parts of the country, and of aiding and directing the efforts of Local Agricultural Associations.

3. The encouragement of Agricultural Education, under powers conferred by a supplementary Royal Charter, granted in 1856, and authorising the Society to grant Diplomas to Students of Agriculture; and by the establishment of Bursaries. The Bursaries were discontinued in 1892.

4. The advancement of the Veterinary Art, by conferring Certificates on Students who have passed through a prescribed curriculum, and who are found, by public examination, qualified to practise. Now terminated in accordance with arrangements with the Royal College of Veterinary Surgeons.

5. The institution of a National Examination in Dairying, jointly with the Royal Agricultural Society of England.

6. The institution of an Examination in Forestry for First and Second Class Certificates.

7. The appointment of a chemist for the purpose of promoting the application of science to agriculture, and to superintend local experiments.

8. The establishment of a Botanical Department.

9. The appointment of Entomologist to advise members regarding insect pests.

10. The annual publication of the 'Transactions,' which comprehend papers by selected writers, Prize Reports, and reports of experiments, also an abstract of the business at Board and General Meetings, and other communications.

11. The management of a fund left by John, 5th Duke of Argyll (the original President of the Society), to assist young natives of the Highlands who enter Her Majesty's Navy.

CONSTITUTION AND MANAGEMENT.

The general business of THE HIGHLAND AND AGRICULTURAL SOCIETY is conducted under the sanction and control of the Royal Charters, referred to above, which authorise the enactment of Bye-Laws.

The Office-Bearers consist of a President, Four Vice-Presidents, Thirty-two Ordinary and Twenty Extraordinary Directors, a Treasurer, an Honorary and an Acting Secretary, an Auditor, and other Officers.

The Council on Education, under the Supplementary Charter, consists of Sixteen Members—Nine nominated by the Charter, and Seven elected by the Society.

PRIVILEGES OF MEMBERS

MEMBERS OF THE SOCIETY ARE ENTITLED—

1. *To receive on application a free copy of the 'Transactions' annually.*
2. *To apply for District Premiums that may be offered.*
3. *To report Ploughing Matches for Medals that may be offered.*
4. *To Free Admission to the Shows of the Society.*
5. *To exhibit Live Stock and Implements at reduced rates.*[1]
6. *To have Manures and Feeding-Stuffs analysed at reduced fees.*
7. *To have Seeds tested at reduced fees.*
8. *To have Insect Pests and Diseases affecting Farm Crops inquired into.*
9. *To attend and vote at General Meetings of the Society.*
10. *To vote for the Election of Directors, &c., &c.*

ANALYSIS OF MANURES AND FEEDING-STUFFS

The Fees of the Society's Chemist for Analyses made for Members of the Society shall, until further notice, be as follow:—

The estimation of *one* ingredient in a manure or feeding-stuff	5s.
The estimation of *two or more* ingredients in a manure or feeding-stuff . . .	10s.

These charges apply only to analyses made for the sole and private use of Members of the Highland and Agricultural Society who are not engaged in the manufacture or sale of the substances a

The Society's Chemist, if requested, also supplies valuations of manures, according to the Society's scale of units.

SEEDS, CROP DISEASES, INSECT PESTS, &c.

The rates of charges for the examination of plants and seeds, crop diseases, insect pests, &c., will be found on pages 37 and 38.

ELECTION OF MEMBERS

Candidates for admission to the Society must be proposed by a Member, and are elected at the half-yearly General Meetings in January and June. It is not necessary that the proposer should attend the Meeting.

CONDITIONS OF MEMBERSHIP

The ordinary annual subscription is £1, 3s. 6d., and the ordinary subscription for life-membership is £12, 12s.; or after ten annual payments have been made, £7, 7s. Proprietors farming the whole of their own lands, whose rental on the Valuation Roll does not exceed £500 per annum, and all Tenant-Farmers, Secretaries or Treasurers of Local Agricultural Associations, Factors resident on Estates, Land Stewards, Foresters, Agricultural Implement Makers, and Veterinary Surgeons, none of them being also owners of land to an extent exceeding £500 per annum, are admitted on a subscription of 10s. annually, which may be redeemed by one payment of £5, 5s., or, after ten annual payments have been made, by one payment of £3, 3s.[2] Subscriptions are payable on election, and afterwards annually in January.

Members are requested to send to the Secretary the names and addresses of Candidates they have to propose (stating whether the Candidates should be on the £1, 3s. 6d. or 10s. list).

JAMES MACDONALD, *Secretary.*

3 GEORGE IV. BRIDGE, EDINBURGH.

[1] Firms are not admitted as Members; but if one partner of a firm becomes a Member, the firm is allowed to exhibit at Members' rates.

[2] Candidates claiming to be on the 10s. list must state under which of the above designations they are entitled to be placed on it.

ESTABLISHMENT FOR 1899-1900

President.

LORD BALFOUR OF BURLEIGH, Kennet, Alloa.

Vice-Presidents.

Duke of Montrose, K.T., Buchanan Castle, Drymen.
Earl of Moray, Doune Lodge, Doune.
Sir Robert Menzies of Menzies, Bart., Camserney, Aberfeldy.
Colonel John Murray of Polmaise, Stirling.

Ordinary Directors.

Year of Election.	
1896	John Speir, Newton Farm, Newton, Glasgow.
	George Dun, Woodmill, Auchtermuchty.
	David Wilson of Carbeth, Killearn.
	John M'Hutchen Dobbie, Campend, Dalkeith.
	Robert F. Dudgeon of Cargen, The Grange, Kirkcudbright.
	John Macpherson Grant, Old Milton, Kingussie.
	Walter Elliot, Hollybush, Galashiels.
1897	Alexander Cross of Knockdon, 19 Hope Street, Glasgow.
	Captain Clayhills Henderson of Invergowrie, R.N., Dundee.
	W. T. Malcolm, Dunmore Home Farm, Larbert.
	Captain Robert Dundas, yr. of Arniston, Kirkhill, Gorebridge.
	William Duthie, Tarves, Aberdeenshire.
	John M'Caig, Challoch, Leswalt.
	Jonathan Middleton, Clay of Allan, Fearn, Ross-shire.
	The Master of Polwarth, Humbie House, Upper Keith.
1898	E. Hedley Smith, B.L., Whittinghame, Prestonkirk.
	William Clark, Netherlea Farm, Cathcart.
	Sir Alan H. Seton Steuart of Touch, Bart., Stirling.
	W. S. Ferguson, Pictstonhill, Perth.
	R. Shirra Gibb, Boon, Lauder.
	R. W. B. Jardine, yr. of Castlemilk, Lockerbie.
	Alexander M. Gordon of Newton, Insch, Aberdeenshire.
	J. Douglas Fletcher of Rosehaugh, Avoch, R.S.O., Ross-shire.
1899	R. Sinclair Scott, Burnside, Largs.
	Sir Robert D. Moncreiffe of Moncreiffe, Bart., Bridge of Earn.
	John Murray, Munnieston, Kippen Station, Stirling.
	Sir Archibald Buchan Hepburn of Smeaton, Bart., Prestonkirk.
	John Marr, Cairnbrogie, Old Meldrum.
	Rev. John Gillespie, LL.D., Mouswald Manse, Ruthwell, R.S.O
	C. M. Cameron, Balnakyle, Munlochy.
	C. H. Scott Plummer of Sunderland Hall, Selkirk.

Extraordinary Directors.

1899	Captain C. Home Graham-Stirling of Strowan, Crieff. Archibald Forrest, Provost of Stirling. Colonel H. S. Home Drummond of Blair Drummond, Stirling. Claude H. Hamilton of Dunmore Park, Larbert. John J. Moubray of Naemoor, Rumbling Bridge. R. C. Mackenzie of Edenbarnet, 2 West Regent Street, Glasgow. John Craig, Innergeldie, Comrie. William Drysdale, King o' Muirs, Alloa. John Edmond, Galamuir, Bannockburn. Parlan Macfarlan, Faslane, Garelochhead.
1897	James Lockhart, Mains of Airies, Stranraer. William Ford, Fentonbarns, Drem.
1898	John M. Martin, 5 Drummond Place, Edinburgh. Andrew Hutcheson, Beechwood, Perth. John Wilson, Chapelhill, Cockburnspath. Wellwood Maxwell of Kirkennan, Dalbeattie.
1899	Sir Ralph Anstruther of Balcaskie, Bart., Pittenweem. George R. Glendinning, Hatton Mains, Kirknewton. John Cran, Kirkton, Bunchrew, Inverness. Robert Paterson, Hill of Drip, Stirling.

Office-Bearers.

Sir James H. Gibson-Craig of Riccarton, Bart., *Treasurer.*
Sir John Gilmour of Montrave, Bart., *Honorary Secretary.*
James Macdonald, F.R S.E., *Secretary.*
Rev. Archibald Scott, D.D., *Chaplain.*
Andrew P. Aitken, D.Sc., 8 Clyde Street, *Chemist.*
William Home Cook, C.A., 42 Castle Street, *Auditor.*
Tods, Murray, & Jamieson, W.S., *Law Agents.*
A. N. M'Alpine, 60 John Street, Glasgow, *Consulting Botanist.*
R. S. MacDougall, M.A., D.Sc., 25 India Street, *Consulting Entomologist.*
John Macdiarmid, *Clerk.*
Edward M. Cowie, *Second Clerk.*
William Williams, F.R.C.V.S., *Professor of Veterinary Surgery.*
William Blackwood & Sons, 45 George Street, *Printers and Publishers.*
Keith & Co., 65 George Street, *Advertising Agents.*
G. Waterston & Sons, 56 Hanover Street, *Stationers.*
Thomas Smith & Sons, 47 George Street, *Silversmiths.*
Alexander Kirkwood & Son, 9 St James' Square, *Medallists.*
John Watherston & Sons, *Inspectors of Works.*
William Simpson, *Messenger.*

Chairman of Board of Directors.

A. M. Gordon of Newton.

Chairmen of Committees.

1. *Argyll Naval Fund* . .	Captain G. D. Clayhills Henderson.
2. *Finance, Chambers, and Law*	Sir James H. Gibson-Craig, Bart.
3. *Publications* . . .	Rev. John Gillespie, LL.D., Mouswald Manse.
4. *Shows*	Sir James H. Gibson-Craig, Bart.
5. *Science*	David Wilson of Carbeth.
6. *General Purposes* . .	Sir James H. Gibson-Craig, Bart.

COMMITTEES FOR 1899-1900

1. ARGYLL NAVAL FUND.

Capt. G. D. Clayhills Henderson of Invergowrie, R.N., Dundee, *Convener*.
Sir David Baird of Newbyth, Bart., Prestonkirk.
Sir Robert Menzies of Menzies, Bart., Camserney, Aberfeldy.
John Maclachlan of Maclachlan, 48 Castle Street, Edinburgh.

2. FINANCE, CHAMBERS, AND LAW.

Sir James H. Gibson-Craig of Riccarton, Bart., *Convener*.
Rev. John Gillespie, LL.D., Mouswald Manse, Ruthwell, R.S.O.
G. R. Glendinning, Hatton Mains, Kirknewton.
Alexander Cross of Knockdon, 19 Hope Street, Glasgow.
A. M. Gordon of Newton, Insch, Aberdeenshire.
Captain Robert Dundas, yr. of Arniston, Kirkhill, Gorebridge.
John M'Hutchen Dobbie, Campend, Dalkeith.
The Master of Polwarth, Humbie House, Upper Keith.
Sir John Gilmour of Montrave, Bart., Hon. Secretary, *ex officio*.
William Home Cook, C.A., Auditor, *ex officio*.

3. PUBLICATIONS.

Rev. John Gillespie, LL D., Mouswald Manse, Ruthwell, R.S.O., *Convener*.
Dr A. P. Aitken, 8 Clyde Street, Edinburgh.
John Speir, Newton Farm, Newton, Glasgow.
David Wilson of Carbeth, Killearn.
R. Shirra Gibb, Boon, Lauder.
Sir Robert D. Moncreiffe of Moncreiffe, Bart., Bridge of Earn.
John M'Hutchen Dobbie, Campend, Dalkeith.

4. SHOWS.

Sir James H. Gibson-Craig of Riccarton, Bart., Currie, *Convener*.
John M. Martin, 5 Drummond Place, Edinburgh, *Vice-Convener*.
Sir Robert Menzies of Menzies, Bart., Camserney, Aberfeldy.
John Cran, Kirkton, Bunchrew, Inverness.
Walter Elliot, Hollybush, Galashiels.
Rev. John Gillespie, LL.D., Mouswald Manse, Ruthwell, R.S.O.
Sir John Gilmour of Montrave, Bart., Leven.
W. H. Lumsden of Balmedie, Aberdeen.
John Marr, Cairnbrogie, Old Meldrum.
James Lockhart, Mains of Airies, Stranraer.
Jonathan Middleton, Clay of Allan, Fearn.
R. Sinclair Scott, Burnside, Largs.
W. S. Ferguson, Pictstonhill, Perth.

George Dun, Woodmill, Auchtermuchty.
Alex. M. Gordon of Newton, Insch, Aberdeenshire.
Alex. Cross of Knockdon, 19 Hope Street, Glasgow.
W. T. Malcolm, Dunmore Home Farm, Larbert.
G. R. Glendinning, Hatton Mains, Kirknewton.
J. D. Fletcher of Rosehaugh, Avoch, R.S.O., Ross-shire.
C. M. Cameron, Balnakyle, Munlochy.
John Wilson, Chapelhill, Cockburnspath.
William Duthie, Tarves, Aberdeenshire.
Robert F. Dudgeon of Cargen, The Grange, Kirkcudbright.
John M'Hutchen Dobbie, Campend, Dalkeith.
John M'Caig, Challoch, Leswalt.
R. W. B. Jardine, yr. of Castlemilk, Lockerbie.
William Clark, Netherlea Farm, Cathcart.
E. Hedley Smith, B.L., Whittinghame, Prestonkirk.
Sir Robert D. Moncreiffe of Moncreiffe, Bart., Bridge of Earn.
John Murray, Munnieston, Kippen Station, Stirling.

5. SCIENCE.

David Wilson of Carbeth, Killearn, *Convener.*
Jonathan Middleton, Clay of Allan, Fearn, Ross-shire, *Vice-Convener.*
G. R. Glendinning, Hatton Mains, Kirknewton.
R. Shirra Gibb, Boon, Lauder.
The Hon. The Master of Polwarth, Humbie House, Upper Keith.
W. S. Ferguson, Pictstonhill, Perth.
John Speir, Newton Farm, Newton, Glasgow.
Andrew Hutcheson, Beechwood, Perth.
Alex. Cross of Knockdon, 19 Hope Street, Glasgow.
Rev. John Gillespie, LL.D., Mouswald Manse, Ruthwell, R.S.O.
John Wilson, Chapelhill, Cockburnspath.
Sir John Gilmour of Montrave, Bart., Leven, Fife.
Sir Ralph Anstruther of Balcaskie, Bart., Pittenweem.
John M'Hutchen Dobbie, Campend, Dalkeith.
John M'Caig, Challoch, Leswalt.
E. Hedley Smith, B.L., Whittinghame, Prestonkirk.
Captain Clayhills Henderson of Invergowrie, R.N., Dundee.
John Edmond, Galamuir, Bannockburn.
Dr Aitken, Chemist, *ex officio.*
A. N. M'Alpine, Botanist, *ex officio.*
Professor Williams, *ex officio.*

6. GENERAL PURPOSES.

Sir James H. Gibson-Craig of Riccarton, Bart., Currie, *Convener.*
The Hon. The Master of Polwarth, Humbie House, Upper Keith.
G. R. Glendinning, Hatton Mains, Kirknewton.
Alex. M. Gordon of Newton, Insch, Aberdeenshire.
Rev. John Gillespie, LL.D., Mouswald Manse, Ruthwell, R.S.O.
John M. Martin, 5 Drummond Place, Edinburgh.
John M'Hutchen Dobbie, Campend, Dalkeith.
Sir John Gilmour of Montrave, Bart., Leven, *ex officio.*

7. NATIONAL DIPLOMAS.

Rev. John Gillespie, LL.D., Mouswald Manse, Ruthwell, R.S.O., *Convener.*
Alex. Cross of Knockdon, 19 Hope Street, Glasgow.
John Speir, Newton Farm, Newton, Glasgow.
David Wilson of Carbeth, Killearn.
James Macdonald, *Secretary.*

8. FORESTRY.

Sir Robert Menzies of Menzies, Bart., Camserney Cottage, Aberfeldy, *Convener*.
Earl of Stair, K.T., Lochinch, Castle-Kennedy Station.
The Master of Polwarth, Humbie House, Upper Keith.
Sir John Gilmour of Montrave, Bart., Leven.
A. M. Gordon of Newton, Insch, Aberdeenshire.
R. C. Munro Ferguson of Raith, M.P., Kirkcaldy.
Colonel F. Bailey, 7 Drummond Place, Edinburgh.
William Dunn, Kenmore, Aberfeldy.
David Keir, Ladywell, Dunkeld.
John Michie, Balmoral, Ballater.

The President, Vice-Presidents, the Treasurer, Honorary Secretary, and Chairman of Directors are members *ex officiis* of all Committees.

MEETINGS.

General Meetings.—By the Charter the Society must hold two General Meetings each year, and, under ordinary circumstances, they are held on the third Wednesday of the months of January and June, at one o'clock, in the Society's Hall, 3 George IV. Bridge, for the election of Members and other business. Twenty a quorum.

By a resolution of the General Meeting on 15th January 1879, a General Meeting of Members is held in the Showyard on the occasion of the Annual Show. This year it will be held at Stirling, on Wednesday, 18th July, at an hour to be announced in the programme of the Show.

With reference to motions at General Meetings, Bye-Law No. 10 provides—"That at General Meetings of the Society no motion or proposal (except of mere form or courtesy) shall be submitted or entertained for immediate decision unless notice thereof has been given a week previously to the Board of Directors, without prejudice, however, to the competency of making such motion or proposal to the effect of its being remitted to the Directors for consideration, and thereafter being disposed of at a future General Meeting."

General Show at Stirling—17th, 18th, 19th, and 20th July.—Entries close for Implements, 14th May; Stock, Poultry, and Dairy Produce, 11th June.

Directors' Meetings.—The Board of Directors meet (except when otherwise arranged) on the first Wednesday of each month from November till June inclusive, at half-past one o'clock P.M., and occasionally as business may require, on a requisition by three Directors to the Secretary, or on intimation by him. Seven a quorum.

Nomination of Directors.—Meetings of Members, for the purpose of nominating Directors to represent the Show Districts on the Board for the year 1900-1901, will be held at the places and on the days after mentioned:—

1. Edinburgh, 3 George IV. Bridge, .	Wednesday, 14th Feb., at 2.
2. Glasgow, North British Station Hotel,	Wednesday, 21st Feb., at 1.
3. Stirling, Golden Lion Hotel, . .	Friday, 23rd Feb., at 1.30.

4. Perth, Salutation Hotel, . . . Friday, 2nd March, at 2.
5. Kelso, Cross Keys Hotel, . . . Friday, 9th March, at 12.30.
6. Dumfries, King's Arms Hotel, . . Wednesday, 14th March, at 1.
7. Aberdeen, Imperial Hotel, . . . Friday, 16th March, at 2.
8. Inverness, Caledonian Hotel, . . Tuesday, 20th March, at 12.30.

The nomination of Proprietors or other Members paying the higher subscription must be made in the 3rd, 6th, 7th, and 8th Districts; and the nomination of Tenant-Farmers or other Members paying the lower subscription, in the 1st, 2nd, 4th, and 5th Districts.

Committee Meetings.—Meetings of the various Committees are held as required.

EXAMINATIONS.

Agriculture (1).—The Examination for 1900 for the National Diploma in Agriculture will be held at the Yorkshire College, Leeds, on the 30th April and 1st, 2nd, 3rd, and 4th May.

Agriculture (2).—The last Examination for the Society's Diploma in Agriculture, only for Candidates who previously failed in two of the subjects, is fixed to be held on Thursday, 12th April 1900.

Forestry.—The Examination for 1900 for the Society's Certificates in Forestry will be held at the Society's office, on Tuesday, Wednesday, and Thursday, 10th, 11th, and 12th April.

Dairy.—The Examination for 1900 for the National Diploma in Dairying will be held at the Kilmarnock Dairy School, on Monday, 1st October, and four following days.

AGRICULTURAL EDUCATION

By a Supplementary Charter under the Great Seal, granted in 1856, the Society is empowered to grant Diplomas.

From 1858 to 1899 the Society held an annual Examination for Certificate and Diploma in Agriculture, winners of the Diploma (F.H.A.S.) being elected Free Life Members of the Society.

In 1898 it was resolved by the Royal Agricultural Society of England and the Highland and Agricultural Society of Scotland to discontinue the independent Examinations in Agriculture held by the two Societies, and to institute in their stead a Joint-Examination for a NATIONAL DIPLOMA IN AGRICULTURE (N.D.A.) This Examination will be conducted under the management of the "National Agricultural Examination Board" appointed by the two Societies. The following are the Members of this Board appointed by the Highland and Agricultural Society for the current year, viz.:—

Rev. JOHN GILLESPIE, LL.D., Mouswald Manse, Ruthwell, R.S.O.
DAVID WILSON of Carbeth, Killearn.
ALEXANDER CROSS of Knockdon, 19 Hope Street, Glasgow.
JOHN SPEIR, Newton Farm, Newton, Glasgow.
JAMES MACDONALD, *Secretary*.

REGULATIONS AND SYLLABUS OF THE EXAMINATION FOR THE NATIONAL DIPLOMA IN THE SCIENCE AND PRACTICE OF AGRICULTURE.

REGULATIONS.

1. The Societies may hold conjointly, under the management of the National Agricultural Examination Board appointed by them, an annual Examination in the Science and Practice of Agriculture, at a convenient centre.

2. Candidates who pass the Examination will receive the National Diploma in Agriculture—the Diploma to be distinguished shortly by the letters "N.D.A."

3. Candidates who obtain not less than a certain percentage of the maximum number of marks in each of the subjects will receive the Diploma with Honours (*see Regulation 7 below*). The Diploma with Honours can only be obtained by a Candidate who obtains Honours marks in each Division of the Examination at the first attempt.

4. A Gold Medal will be awarded to the Candidate on the Honours List who obtains the highest number of total marks in the whole Examination.

5. The Examination will be conducted by means of written papers and oral Examinations. Candidates are requested to note that the marks for the paper-work will be allotted in the light of the oral Examination.

6. The Examination shall be taken in Two Divisions as follows:—

First Division.	*Second Division.*
1. Mensuration and Land Surveying.	6. Practical Agriculture.
2. Agricultural Botany.	7. Agricultural Book-keeping.
3. General Chemistry.	8. Agricultural Chemistry.
4. Geology.	9. Agricultural Engineering.
5. Agricultural Entomology.	10. Veterinary Science.

7. The maximum number of marks, the minimum number of marks in each subject qualifying for the Diploma, and the minimum number of marks qualifying for the Diploma with Honours, are as follows :—

First Division—

Subject.	Max. No. of Marks.	Pass Marks for Diploma.	Marks for Honours.
1. Mensuration and Land Surveying .	200	120	150
2. Agricultural Botany	200	120	150
3. General Chemistry	100	60	75
4. Geology	100	50	60
5. Agricultural Entomology . . .	100	50	60

Second Division—

6. Practical Agriculture	500	300	375
7. Agricultural Book-keeping . .	200	120	150
8. Agricultural Chemistry . . .	200	120	150
9. Agricultural Engineering . . .	200	120	150
10. Veterinary Science	100	50	60

8. In ordinary circumstances a Candidate shall not be entitled to take both Divisions at one time. A year at least must elapse between the passing of the First Division and sitting for the Second Division; and the Second Division must, except with the special permission of the Board, be taken within two years of the passing of the First Division.*

* *This Regulation will not come into force till the year* 1901. *At the first Examination, to be held in* 1900, *Candidates may enter for both Divisions.*

9. In special circumstances the Board may give permission to a Candidate to enter for both Divisions at one time.

10. A deposit of £1 will be required from each Candidate for each Division. This deposit will be returned to those who obtain Pass marks in all the subjects at that examination. The Board may at their discretion allow a deposit paid by an unsuccessful Candidate to be used for one subsequent Examination in the same Division.

11. A Candidate who fails to obtain Pass marks in any of the subjects in the Division for which he is sitting must take the entire Division again.

12. Holders of both the First Class Certificate of the Royal Agricultural Society of England and the Diploma of the Highland and Agricultural Society of Scotland will not be eligible for this Examination; holders of only one of these distinctions may enter for this examination in 1900 or 1901.

13. The Board reserve the right to postpone, abandon, or in any way, or at any time, modify an Examination, and also to decline at any stage to admit any particular Candidate to the Examination.

14. The first Annual Examination will be held at the Yorkshire College, Leeds, on the 30th April and 1st, 2nd, 3rd, and 4th May 1900. Forms of application for permission to sit at the Examination may be obtained from either of the undersigned.

By Order,

ERNEST CLARKE,
Secretary, Royal Agricultural Society of England,
13 Hanover Square, London, W.

JAMES MACDONALD,
Secretary, Highland and Agricultural Society of Scotland,
3 George IV. Bridge, Edinburgh.

SYLLABUS OF SUBJECTS FOR EXAMINATION.

FIRST DIVISION.

I.—MENSURATION AND LAND SURVEYING.

1. Ordinary rules of superficial and solid mensuration. Volume of a prismoid. Applications to practical questions. Estimation of weights of bodies whose dimensions and specific gravity are known.

2. Land surveying by chain. Plotting from field-book, and determination of areas surveyed. The simpler "field problems."

3. The use and adjustment of instruments employed in Surveying and Levelling.

4. Levelling and plotting from field-book.

5. A sufficient knowledge of Trigonometrical Surveying for the determination of heights and distances by Theodolite; as essential to this, solution of plane triangles by the aid of Logarithmic Tables.

6. A knowledge of the various classes of maps published by the Ordnance Survey Department and their Scales.

N.B.—*Each candidate should have with him at the Examination a pair of compasses, scales of equal parts, including a scale of one chain to an inch, and the scale fitting the Ordnance map,* $\frac{1}{2500}$, *or* 25·344 *inches to the mile, a small protractor, a set square, and a straight-edge about* 18 *inches in length.*

II.—AGRICULTURAL BOTANY.

1. *Morphology.*—The structure of plants. The principles of classification. The Natural Orders (Phanerogams and Cryptogams) dealing specially with those of importance to the Agriculturist.

2. *Physiology.*—The life of the plant. Organs and their functions—nutritive and reproductive.

3. *Pathology.*—Diseases of plants, and their causes. Parasites—Phanerogams, Fungi, Bacteria. Prevention and cure.

4. *Cultivation.*—Conditions in plant life favourable to (*a*) the improvements of cultivated plants, and (*b*) the destruction of weeds. New varieties of plants. Pastures. Pruning.

N.B.—*Candidates will be required to identify plants usually found on a farm.*

III.—GENERAL CHEMISTRY.

1. *The Chemical Elements.*—Definition and classification of elements. Occurrence in nature and leading characters of the elements most commonly met with.

2. *Common Chemical Compounds.*—Preparation and properties of common products of inorganic chemistry (such as the mineral acids, alkalies, salts, &c.)

3. *Laws and Theory.*—The laws of chemical combination. Explanation of equivalence. Distinction of chemical and mechanical compounds. Laws of gaseous diffusion. The atmosphere. Theory of combustion.

4. *Analysis.*—Qualitative and quantitative analysis of atmospheric air. Quantity of air required in combustion. Qualitative analysis of common inorganic substances. Quantitative analysis in simple cases (such as the determination of strength of solutions, proportions of acids and bases in simple salts) by volumetric and gravimetric methods. Ultimate organic analysis by combustion. Proximate analysis by solvents; dialysis and fractional distillation.

5. *Carbon Compounds.*—Ordinary alcohol and ether, and the most common ethylic salts. Oxalic acid, lactic acid, acetic acid and its homo-

logues, fats, glycerine, and soap. Paraffins. Phenol. Cyanogen and its most common compounds, urea, and uric acid. Saccharine and amylaceous compounds. Turpentine and resin. Tannin. Albumen. Gelatine. Fermentation.

N.B.—*In this section exact knowledge of general principles and typical compounds is expected, rather than diffuse information.*

IV.—GEOLOGY.

1. Chief minerals entering into the composition of rocks. Origin and composition of aqueous and igneous rocks. General principles of the classification of rocks. Leading divisions of the stratified rocks, and their geographical distribution in the British Islands.
2. Stratification, cleavage, and faulting of rocks.
3. Influence of the geological structure of a country on the configuration of the land and the composition of the soil. Relation of Strata to water-supply and drainage. Origin of springs.
4. The various mineral manures, their sources, characters, and mode of occurrence.
5. Different kinds of building-stones and road materials. Distribution of the various economical substances.

N.B.—*Candidates will be required to name and describe common rocks, minerals, and fossils.*

V.—AGRICULTURAL ENTOMOLOGY.

1. The position of Insects in the Animal world, with the characters that mark them out from related animal groups.
2. *General Structure of Insects.*—Head, Thorax, Abdomen, Alimentary Canal, Circulation, Respiratory System, Nervous System and Sense Organs, Reproductive System.
3. *Metamorphosis of Insects*, with the economic importance of the different stages.
4. *Classification of Insects.*—The general characters of the following Natural Orders: Coleoptera, Lepidoptera, Hymenoptera, Diptera, Hemiptera, Orthoptera, Neuroptera.
5. *Larvæ.*—Their varying forms as a help to identification.
6. The *Life-history* of the Insects, Worms, and Acarines injurious to Food Crops generally and to Live Stock. Recognition of the common pests by external characters and by their work.
7. Insects useful in Agriculture.
8. Circumstances favouring Insect increase. Farm practice in relation to the discouraging of Insect attack.
9. *Preventive and Remedial Measures.*—Encouragement of Insect-eating birds and mammals. Fungoid diseases of Insects. Artificial remedies. Insecticides and their composition and preparation.

N.B.—*Where the Candidate is not acquainted with the scientific name of an Insect, the generally received English name will be accepted.*

SECOND DIVISION.

VI.—PRACTICAL AGRICULTURE.

1. *Soils.*—Classification of soils—characters and composition—suitability for cultivation.
2. *Improvement of Soil.*—Drainage, Irrigation, and Warping. The application of lime—marl—clay—ashes, &c.

3. *Rotations.*—The principles of rotations—rotations suitable for different soils and climates—systems of farming.

4. *Manures.*—The properties of manures—general and special—amounts used per acre—period and mode of application—treatment and disposal of sewage.

5. *Food-stuffs.*—The properties of feeding substances—their suitability for different classes of farm stock—considerations affecting their use—rations for different classes of stock.

6. *Crops.*—Farm crops (cereals, agricultural grasses and clovers, forage plants and roots). How they grow—their cultivation, including cleaning, harvesting, and storage—diseases—insect injuries and remedies.

7. *Weeds and Parasitic Plants.*—Best methods of eradication.

8. *Pests of the Farm.*—Injuries to crops and live stock of the farm due to mammals, birds, and insects, with their prevention and remedies.

9. *Weather.*—Meteorology, or the effect of climate on farming conditions.

10. *Live Stock.*—The breeding, rearing, feeding, and general treatment of farm stock—the different breeds of horses, cattle, sheep, pigs, and poultry—their characteristics—the districts where they are generally met with.

11. *Milk.*—The production and treatment of milk—the manufacture of cheese, butter, &c.—the utilisation of bye-products.

12. *Machinery.*—The uses and prices of the machines and implements used in farming in different parts of Great Britain.

13. *Buildings.*—Buildings required on different classes of farms in various districts.

14. *Farming Capital.*—Calculations of the cost of stocking and working arable, stock, and dairy farms. Farm valuations. Rent, taxes, and cost of labour.

N.B.—*It is essential that a Candidate know his subject practically, and that he satisfy the Examiner of his familiarity with farm routine.*

VII.—AGRICULTURAL BOOK-KEEPING.

1. Agricultural Book-keeping—Description of books to be kept, with examples.
2. Valuation of stock and effects.
3. Profit and Loss, and Balance Sheet.

VIII.—AGRICULTURAL CHEMISTRY.

1. *Soil.*—The origin, formation, and classification of soils. The constituents of soils. The supply of plant-food by the soil. The chemical and physical properties of soils of different kinds. The adaptation of soils to particular crops. The relations of air and water to soils. Nitrification and the biology of the soil. The chemical and physical effects of tillage operations and drainage. The improvement of soils. Causes of infertility. Mechanical and chemical analysis of soils.

2. *Plant-life.*—The constituents of plants. The relations of atmosphere, rainfall, heat, and light to vegetation. The sources of plant-food.

3. *Manures.*—The supply of plant-food by manure. The improvement of the soil by manuring. The classification of manures as regards their composition, nature, and use. The manures in general use upon the farm. Farmyard manure and other natural manures. Green-manuring. Liming, marling, claying. Artificial manures, their origin and manufacture. The changes which manures undergo in the soil. The influence

of drainage. The application of manures. The analysis of manures. The adulteration of manures.

4. *Crops.*—The composition of the principal farm crops. Characteristics of particular kinds of crops. The influence of climate and season. The manuring of particular crops. The changes that take place in crops during the various stages of their growth. Rotation of crops.

5. *Foods.*—The constituents of foods, and their functions. The nutritive value and digestibility of foods. The chemical composition and use of the principal feeding-stuffs employed on the farm, and the sources of their supply. The main facts regarding respiration and digestion. The relation of foods to the production of work, meat, milk, and manure. The adaptation of foods to special requirements. The residual manurial value of foods, and the circumstances affecting it. The estimation of unexhausted fertility. Analysis and adulteration of foods.

6. *Water.*—Rain-water. Hard and soft waters. Drinking waters. Irrigation and sewage.

7. *Dairying.*—The composition of milk, and the conditions which influence its quality and supply. Cream and cream-separation. Butter and butter-making. Cheese and cheese-making. The influence of ferments on milk and milk products. The preservation of milk. Milk-testing.

IX.—AGRICULTURAL ENGINEERING.

1. *Heat.*—Nature of heat; thermometer; absolute zero; specific heat; latent heat; the unit of heat. Total heat of water; as ice, water, and steam. Conduction, convection, and radiation of heat. Mechanical equivalent of heat. Principle of combustion. Quantity of heat generated by combustion. Modes of transforming heat of combustion into power, as in the steam-engine, and gas and oil engine.

2. *Air.*—Properties of air; elasticity, specific heat. Barometer. Moisture. Movement. Winds. Windmills.

3. *Water.*—Composition. Weight. Height of column to balance atmosphere. Flow of water. Friction of water in pipes and channels. Usual speed of flow. Power derived from falls of water. Water-wheels; turbines; water-pressure engines; pumps. Potable water. Sources of supply. Means of purification. Storage.

4. *Mechanics.*—Centre of gravity; stability of structures. The lever; toothed wheels; pulleys and ropes; wrapping connectors; winches; differential pulleys. Laws of motion. Strength of materials, tensile, compressive, torsional, and transverse; elastic limit; ultimate strength. Work; horse-power; animal and human power. Friction of surfaces and axles; lubrication.

5. *Steam-engine.*—Construction of an ordinary portable-engine boiler, of a Cornish boiler, and its setting. Fittings of a boiler. Construction of the stationary and portable steam-engine. Single cylinder. Double cylinder. Compound. Slide-valve. Expansion valve. Cylinder. Piston-rod. Glands. Connecting-rod. Crank and crank shaft. Fly-wheel. Bearings. Pet cocks. Lubrication. Steam and fuel consumed per horse-power.

6. *Gas and Petroleum Engines.*—Principle of action. Construction of valve-gear. Sources of loss. Fuel and water required per horse-power.

7 *Electrical Generators, Motors, and Conductors.*—Principles of action—shunt; losses in electrical machinery. Efficiency. Detection of faults. Regulation of shunt and series motors. Use of fuses and cut-outs. Horse-power of motors, and calculation of Watts to be delivered at terminals. Ohm's law. Losses in conductors, and calculation of sizes to convey given currents with definite losses. Jointing and insulation of conductors.

8. *Construction of Agricultural Implements.*—The mode of action and the general principles involved in the construction of farm implements. The adjustments of implements for different descriptions of work. Lubrication. Working or wearing parts.

9. *Cultivating Implements worked by Steam Power.*

10. *Horse-cultivating Implements.*—Ploughs. Cultivators or Grubbers. Harrows. Rollers. Scrubbers, &c.

11. *Sowing Implements.*—Drills. Manure and water drills. Broadcast barrows. Broadcasters. Manure distributors. Potato planters, &c.

12. *Hoeing Implements.*—Horse-hoes. Scufflers.

13. *Securing of Crops.*—Reaping machines. Mowing machines. Haymakers. Horse-rakes. Elevators. Silage appliances. Potato raisers, &c.

14. *Carriages.*—Carts. Waggons. Sleighs. Rick-lifters, &c.

15. *Preparing Crops for Market.*—Threshing machines. Winnowing machines. Corn screens. Hummellers. Hay and straw presses, &c.

16. *Preparing Foods.*—Mills. Chaff-cutters. Pulpers. Turnip-cutters. Cake-breakers. Cooking apparatus.

17. *Dairy Appliances.*—Cream separators. Churns. Butter-workers. Cheese tubs. Curd mills. Cheese presses. Setting-pans. Refrigerators, &c.

18. *Land Improvement.*—Drainage instruments. Limekilns. Arrangements of shafting, pulleys, clutches, &c., for farm machinery at homesteads.

N.B.—*Marks will be given for neatness and accuracy of Drawing.*

X.—VETERINARY SCIENCE.

1. Anatomy and Physiology, including the comparative anatomy of the bones of the animals of the farm, and the structure and functions of the different organs and tissues of the horse, ox, sheep, and pig.

2. The digestive processes and principles of nutrition in the above animals.

3. A general knowledge of the blood and its circulation, and the processes of respiration, secretion, and excretion.

4. The physiology of reproduction, and its bearings on healthy breeding.

5. The period of gestation in the mare, cow, ewe, and sow, and the special management of these animals prior to, at the time of, and after parturition.

6. The management of farm stock in health and disease.

VETERINARY DEPARTMENT

The Society established a Veterinary Department in 1823, but by an arrangement made with the Royal College of Veterinary Surgeons, the Society's examination ceased in 1881. Holders of the Society's Veterinary Certificate are entitled to become Members of the Royal College of Veterinary Surgeons on payment of certain fees, without being required to undergo any further examination. The number of Students who passed for the Society's Certificate is 1183.

The Society votes annually twelve silver medals for Class Competition to each of the two Veterinary Colleges in Edinburgh, and to the one in Glasgow.

FORESTRY DEPARTMENT

The Society grants FIRST and SECOND CLASS CERTIFICATES in FORESTRY.

BOARD OF EXAMINERS.

Science of Forestry, Practical Management of Woods, and Forest Entomology.—COLONEL BAILEY, Lecturer on Forestry, Edinburgh University, 7 Drummond Place; Dr SOMERVILLE, Professor of Agriculture, University of Cambridge; J. GRANT THOMSON, Grantown, Strathspey; D. F. MACKENZIE, Morton Hall, Liberton, Mid-Lothian; ANDREW SLATER, Osborne, Isle of Wight.

Forest Botany and Zoology.—Professor BAYLEY BALFOUR, A. N. M'ALPINE, and Dr R. S. M'DOUGALL.

Physics, Chemistry, and Meteorology.—Dr A. P. AITKEN and Dr WM. CRAIG.

Land and Timber Measuring and Surveying; Mechanics and Construction, as applied to Fencing, Drainage, Bridging, and Road-making.—A. W. BELFRAGE, C.E., Edinburgh.

Book-keeping and Accounts.—WM. HOME COOK, C.A., Edinburgh.

Candidates must possess—1. A thorough acquaintance with the theory and practice of Forestry. 2. A general knowledge of the following branches of study, so far as these apply to Forestry: The Elements of Botany; The Elements of Physics, Chemistry, and Meteorology; Forest Entomology; Land and Timber Measuring and Surveying; Mechanics and Construction, as applied to fencing, draining, bridging, and road-making; Implements of Forestry; Book-keeping and Accounts.

The examinations[1] are open to candidates of any age, will be both written and oral, and will include such practical tests as may from time to time be found convenient to apply.

The maximum number of marks for each subject is 100; First-Class marks in all subjects 75, Second-Class marks in all subjects 50, Pass marks in all subjects 40.

To obtain the *First-Class Certificate* a Candidate must have First-Class marks in Forestry and any two of the other subjects, and Pass in the two remaining subjects. To obtain the *Second-Class Certificate* a Candidate must obtain Second-Class marks in Forestry and in any two of the other subjects, and Pass in the two remaining subjects.

If a Candidate has obtained First-Class marks in Forestry and failed in only one or two of the other subjects, he can come up again for examination in these subjects alone for the *First-Class Certificate*, otherwise he must go through the entire examination again.

The list of students who obtained Certificates prior to 1899 appears in the 'Tranactions,' Fifth Series, vol. xi. (1899).

The following obtained First-Class Certificates in 1899:—

ERIC ARTHUR NOBBS, Edinburgh.
GEORGE POTTS, Whitehurworth, Trimdon Grange, Durham.

[1] The Examination will be held in 1900 on the 10th, 11th, and 12th April.

SYLLABUS OF EXAMINATION

I.—SCIENCE OF FORESTRY AND PRACTICAL MANAGEMENT OF WOODS.

I. *Principles of Scientific Forestry.*—1. Effects of heat, light, moisture, and air-currents on forest vegetation. 2. Effects of depth, porosity, moisture, and chemical composition of the soil on forest vegetation. 3. Effects of forest vegetation on the soil and air. 4. Rate and extent of development, longevity, and reproductive power of trees. 5. Pure and mixed woods. 6. Systems of sylviculture.

II. *Practical Management of Woods.*—7. Draining and irrigation. 8. Choice of species for various situations. 9. Seed and sowing, including nurseries. 10. Planting. 11. Natural regeneration by seed, shoots, and suckers. 12. Formation of mixed woods. 13. Tending of young woods. 14. Pruning. 15. Thinning. 16. Sylvicultural characteristics of the principal trees.

III. *Injuries by Storms and Fires.*—17. Storms. 18. Fires.

IV. *Timber.*—19. Its technical properties. 20. Its defects. 21. Recognition of different kinds of timber. 22. Processes for increasing its durability.

V. *Utilisation of Produce.*—23. Uses of wood and other produce. 24. Felling. 25. Conversion. 26. Seasoning. 27. Transport. 28. Sales. 29. Harvesting of bark.

VI. *Forest Organisation.*—30. General ideas regarding a regulated system of forest management.

Books recommended.—Schlich's 'Manual of Forestry'; Nisbet's 'British Forest Trees'; Nisbet's 'Studies in Forestry'; Fürst's 'Protection of Woodlands,' translated by Nisbet; Hough's 'Elements of Forestry'; Brown's 'Forester' (latest edition); Laslett's 'Timber and Timber Trees.'

II.—FOREST BOTANY AND FOREST ZOOLOGY.

(a) Forest Botany.

The fundamental facts of morphology, physiology, and classification of plants. The structure and function of the plant-cell and the plant-tissues. Their primary distribution. The secondary changes they exhibit in consequence of perennation.

The structure and function of the root and shoot in flowering-plants. Buds, their forms and uses. The flower. The fruit. The seed.

The structure and function of vegetative and reproductive organs of fungi.

Relationship of plants to air, soil, and water. Effect of light, heat, and mechanical agencies upon plants. Nutrition. The nature and elements of the food of plants. Sources of plant-food. The absorption, elaboration, transference, and storage of food. Respiration and transpiration. Parasites and saprophytes. Symbiosis.

Growth of plants in length and thickness. Correlation of growth, pruning. Germination of seeds. Formation of wood and bark. Healing of wounds.

Diseases of plants due to faulty nutrition and unfavourable circumstances of growth. Diseases due to attacks of fungi.

Natural reproduction and propagation by seeds and by buds. Fertilisation of flowers. Hybridisation. Artificial propagation by budding, grafting, layering, and cutting.

The characters of the large groups and classes of the vegetable kingdom. The characters of the families of plants which include the chief timber trees. The botanical characteristics of the principal British forest-trees (including the structural features of their wood). The weeds of the forest and their significance.

Books recommended.—Scott, 'Structural Botany'; Prantl and Vines, 'Text-Book of Botany'; Marshall Ward, 'Timber and some of its Diseases'; Marshall Ward, 'Diseases of Plants'; Marshall Ward, 'The Oak'; Schlich's 'Manual of Forestry,' vol. ii., Appendix to chapter iv., by Marshall Ward; Hartig, 'Timbers, and how to know them,' translated by Somerville; Hartig, 'Anatomy and Physiology of Plants,' translated by Nisbet; Hartig, 'Diseases of Plants,' translated by Marshall Ward and Somerville; Warming, 'Handbook of Systematic Botany,' translated by Potter; Bower, 'Practical Botany for Beginners.'

(*b*) Forest Zoology.

The group Insecta: its position in the animal kingdom. Structure, mode of reproduction, and metamorphosis of insects. The outlines of classification of the group. Conditions favourable to the numerical increase of insects. Natural checks to increase (*e.g.*, birds, mammals, parasitic insects). The identification and life-history of the more important insects injurious to forest-trees and fruit-trees. The damage caused by these insect pests and their mode of attack. The damage caused by animals. Preventive and remedial measures.

Books recommended.—Ormerod, 'Manual of Injurious Insects'; Fürst, 'Protection of Woodlands,' translated by Nisbet; various articles in 'Transactions' of Highland and Agricultural Society and of Royal Scottish Arboricultural Society.

III.—PHYSICS, CHEMISTRY, AND METEOROLOGY.

Mass, weight, specific gravity, solid, liquid, and gaseous states of matter. Capillarity, osmose, vapour tension, suction pump, force pump, syphon, barometer, atmospheric pressure. Boyle's law. Levers and pulleys. Heat, measurement of heat, specific heat; transference of heat by conduction, convection, and radiation. Boiling and freezing. Latent heat. The thermometer. The conservation and transformation of energy. Light—reflection, refraction, polarisation; the spectrum. The rudiments of electricity and magnetism.

Chemistry.

Elements. Oxygen, hydrogen, nitrogen;—their preparation, properties, and chief compounds. Acids, bases, salts. Combustion, oxidation, reduction. Sulphur, Carbon, Phosphorus; and their compounds, with oxygen and hydrogen. Metals—potassium, sodium, calcium, magnesium, aluminium, iron, copper, lead, mercury, and their chief compounds. Carbohydrates, marsh gas, olefiant gas, alcohol, acetic acid, oxalic acid. Distillation of wood and coal.

Meteorology.

The atmosphere, its composition and physical properties. Measurement of pressure and temperature. The barometer. Rain, hail, snow, fog, cloud, dew, the dew point, hoar frost. The weathering of rocks and soils. Gases injurious to vegetation.

Books recommended.—'Elementary Physics,' Balfour Stewart; 'Lessons in Elementary Chemistry,' Roscoe; 'Introductory Text-Book of Meteorology,' Buchan.

IV.—LAND AND TIMBER MEASURING AND SURVEYING; MECHANICS AND CONSTRUCTION AS APPLIED TO FENCING, BRIDGING, AND ROAD-MAKING.

1. The use of the level and measuring-chain. Measuring and mapping surface areas. 2. The measurement of solid bodies—as timber, stacked bark, fagots, &c., earthwork. 3. The different modes of fencing and enclosing plantations; their relative advantages, durability, cost of construction, and repairs. 4. The setting out and formation of roads for temporary or permanent use. 5. The construction of bridges over streams and gullies; of gates or other entrances.

Books recommended.—'Agricultural Surveying,' by John Scott (Weale's Series); Hoppus's 'Tables'; 'Farm Roads, Fences, and Gates,' by John Scott (Weale's Series); Brown's 'Forester' (latest edition).

V.—BOOK-KEEPING AND ACCOUNTS.

1. Questions in Practice, Proportion, and Decimal Fractions. 2. Book-keeping—describe books to be kept; and best method of valuing timber. 3. Practical questions in Book-keeping will also be given.

Book recommended.—Brown's 'Forester' (latest edition).

EXAMINATION PAPERS, 1899

PRACTICAL FORESTRY.

1. Describe the method that should be adopted in forming a plantation on lands of various qualities, altitudes, and exposures, say—
   (*a*) High lying, very exposed, thin, peaty, damp soil.
   (*b*) Moderately exposed, deep but moory soil.
   (*c*) Low lying, deep alluvial soil; and
   (*d*) Deep sandy soil, exposed to sea breezes.

State variety of plants, age, best time to plant, method of planting, and distance apart.

2. Give an account, up to the end of the fourth year, of the nursery treatment of the oak, Scots fir, beech, hawthorn, ash, poplar, and lime. What area of seed-bed will be stocked by 1 lb. of the seed of larch and beech respectively, and how many two-year-old seedlings would you expect to get in each case? Suppose you have 20 square yards of a well-stocked bed of two-year-old Scots fir seedlings, how many square yards of ground would you have to provide for lining out the young plants?

3. In forming an estate nursery for general purposes—
   (1) Indicate suitable exposure, aspect, and soil. If drainage is required, give depth of drain and size of pipes.
   (2) What preparation, manuring, and method of cropping would you recommend?
   (3) When would you gather the ripe seed of Scots fir, spruce, larch, silver fir, and elm in the case of trees which are producing flowers this spring?

4. What kind of situation is best adapted for the successful cultivation in woods of oak, beech, elm, larch, Scots fir, and Douglas fir? Suppose you have to deal with two areas fully stocked with Norway spruce fifty years old—the one area of first-class quality, but the other distinctly inferior as regards soil and situation—how many trees would you expect to find on an acre in each case, and what might be the average cubic contents per tree?

5. What advantages do mixed woods offer as compared with pure woods? What general principles should guide one in mixing trees? Discuss the mixture of silver fir and larch, and indicate conditions for which it is suitable.

6. Describe the general management of woods from one to thirty years of age:—

(1) Artificially formed.
(2) Naturally reproduced.

What system of pruning would you recommend for—

(*a*) Conifers;
(*b*) Broad-leaved trees or Hardwoods?

(*Two hours allowed.*)

FOREST BOTANY AND FOREST ENTOMOLOGY

Candidates are expected to answer five of the questions—three from the Section of Forest Botany, and two from the Section of Forest Entomology.

(*a*) Forest Botany.

1. Arrange the British trees in groups according to their fruits. Define each group, and show how the features of the seed are correlated with the character of the fruit.

2. Write an account of the life-history of Agaricus melleus. What is its importance in relation to the life of a tree?

3. Describe in detail the method of healing of wounds in trees. How do stool shoots arise?

4. Separate the Gymnospermæ from the Angiospermæ—

(*a*) By vegetative characters;
(*b*) By reproductive characters.

(*b*) Forest Entomology.

1. How would you distinguish the pine beetle (*Hylesinus piniperda*) and the pine weevil (*Hylobius abietis*) as regards—

(1) Appearance;
(2) Life-history;
(3) Damage done;
(4) Preventive and remedial measures?

2. Define "metamorphosis" of insects, pointing out the real significance of the resting or pupal stage. Compare the metamorphosis of the cockroach, the pine saw-fly, the green fly or aphis, the goat-moth.

3. Give the life-history of the woolly aphis of the apple-tree, with preventive and remedial measures.

(*Two hours allowed.*)

CHEMISTRY, PHYSICS, AND METEOROLOGY.

1. A piece of metal weighs 2·5 lb. in air and 2 lb. in water; what is its specific gravity?

2. Distinguish between conduction and convection of heat, and show by appropriate examples how these processes may be advantageously employed.

3. How is nitric acid made? What is the action of nitric acid on copper, ferrous chloride, starch?

4. What happens to each of the following substances when heated?—

Ammonium chloride;
Ferrous sulphate;
Calcium carbonate.

(*An hour and a half allowed.*)

LAND AND TIMBER MEASURING AND SURVEYING; MECHANICS AND CONSTRUCTION AS APPLIED TO FENCING, DRAINAGE, BRIDGING, AND ROAD-MAKING.

1. Explain how to test a level in order to ascertain that its adjustment is correct.

2. It is required to run a fence in a straight line across a hill between two fixed points at either side: the one cannot be seen from the other, but both can be seen from the highest part. Explain, with sketch, how this can be most expeditiously done.

3. Give specification of a stob and wire fence of a substantial kind for a new road formed in banking and cutting for a length of a mile on both sides, and probable cost of same.

4. A winding avenue, 15 feet wide, is to be made through a thick plantation. Describe how this is to be done, and give specification of road formation and making. Fencing need not be included.

5. There is a hollow in a field to be drained to a point distant 15 chains, which is 5 feet lower than the hollow. The intervening ground rises to a height of 8 feet above the hollow at a distance of 6 chains from it, and falls from there to the point of outlet of the drain. Draw a section showing the ground surface and the line of the drain, and mark upon it the depths to be cut at each chain so that the drain may have a uniform fall; also give the gradient of the drain.

6. A burn has got silted up, and renders the drains discharging into it inoperative. The banks are liable to slip. Describe the steps to be taken to scour it out and prevent the sides slipping after it has been deepened.

7. Calculate the cubic contents of a heap of soil 18 feet 6 inches by 9 feet 9 inches on top, 4 feet high, and side slopes all round of $1\frac{1}{2}$ to 1.

(*Two hours allowed.*)

ARITHMETIC AND BOOK-KEEPING.

1. Simplify—

(1) $\dfrac{\frac{11}{3}+\frac{3}{11}}{\frac{11}{93}+\frac{3}{37}} \times \frac{7}{5}$ of $\frac{7}{13} \times \dfrac{\frac{6}{5}-\frac{9}{13}}{\frac{6}{5}+\frac{3}{13}} \times \dfrac{\frac{1}{4}-\frac{1}{25}}{2\frac{3}{20}-1\frac{3}{25}}$

(2) $12{\cdot}36\dot{7}8\dot{} + {\cdot}03\dot{4}17892 - 2{\cdot}10\dot{3} - {\cdot}0\dot{0}03\dot{8} + 5{\cdot}36.$

2. Find by Practice the value of 11 tons 19 cwt. 3 qrs. 10½ lb. at £1, 4s. 6d. per cwt.

3. If a plank 6 feet 6 inches in length, 10 inches in breadth, and 1½ inch thick, weigh 35 lb., what will be the cubic contents of a log weighing 1 ton 16 cwt. 1 qr.?

4. If 10 French wood-cutters, working 10½ hours a-day, take 57 days to fell a certain number of trees, how long will 14 Scotch wood-cutters, working 9½ hours a-day, take to fell twice as many trees, if one Scotchman can, on the average, work half as fast again as a Frenchman?

5. A cistern has 3 pipes, A, B, and C; A and B can fill it in 3 and 4 hours respectively, and C can empty it in one hour. If these pipes be opened in order at 3, 4, and 5 o'clock, when will the cistern be empty?

6. Describe briefly the books a forester ought to keep, and their nature and use.

7. The following are the transactions in connection with the Westburn Woods for the half-year ending 30th June 1898. Frame a branched statement of Receipts and Payments:—

1898.					
Jan.	1.	Balance in hand	£27	3	6
"	"	" in bank	265	0	0
"	25.	Received and paid into bank rent of sawmill for half-year to 31st ult.	50	0	0
Feb.	13.	Paid W. Stewart, stationer	5	17	6
"	"	Drawn from bank and paid W. Thomson for young trees for nursery	52	10	0
"	"	Paid John Smith, repairs to sawmill . .	6	10	6
Mar.	10.	Received and paid into bank proceeds of sale of larch timber by public auction . . .	750	0	0
"	31.	Drawn from bank and paid wages for quarter, as per wage list	230	0	0
April	1.	Paid Messrs Flett & Walker, printing catalogues for sale	8	3	0
May	15.	Paid landlord's proportion of premium of insurance over sawmill	1	5	0
"	"	Drawn from bank and paid amount of assessments	35	10	6
June	9.	Received from J. Wakefield price of oak timber sold to him by private contract . .	110	0	0
"	10.	Paid W. Burns, auctioneer . . .	7	10	0
"	"	" expenses of prosecution of poacher . .	15	15	0
"	30.	Drawn from bank and paid wages for quarter as per wage list	235	0	0
"	"	Drawn from bank and paid John Wood, forester, salary for half-year to date	150	0	0
"	"	Drawn from bank and remitted Sir W. Wallace .	300	0	0

(An hour and a half allowed.)

DAIRY DEPARTMENT

EXAMINATION IN THE SCIENCE AND PRACTICE OF DAIRYING

This Examination, instituted in 1897, is conducted by the National Agricultural Examination Board, appointed jointly by the Royal Agricultural Society of England and the Highland and Agricultural Society of Scotland.

REGULATIONS.

1. The Societies may hold annually in England and in Scotland, under the management of the National Agricultural Examination Board appointed by them, one or more Examinations for the National Diploma in the Science and Practice of Dairying; the Diploma to be distinguished shortly by the letters "N.D.D."

2. The Examinations will be held on dates and at places from time to time appointed and duly announced.

3. A deposit of £1 will be required from each candidate, which deposit will be returned to those who succeed in obtaining the Diploma. The Board may, at their discretion, allow the deposit paid by an unsuccessful candidate to be used for one subsequent Examination for the Diploma.

4. Forms of Entry for the Examination in England may be obtained from the Secretary of the Royal Agricultural Society of England, 13 Hanover Square, London, W., and must be returned to him duly filled up, with the deposit of £1, on or before August 31st.

5. Forms of Entry for the Examination in Scotland may be obtained from the Secretary of the Highland and Agricultural Society of Scotland, 3 George IV. Bridge, Edinburgh, and must be returned to him duly filled up, with the deposit of £1, on or before August 31st.

6. A candidate may enter for the Examination either in England or Scotland, but not in both; and a candidate who has once taken part in an Examination in England cannot enter for an Examination in Scotland, or *vice versa*.

7. A candidate will be required to satisfy the Examiners, by means of written papers, practical work, and *vivâ voce*, that he or she has—

(1) A thorough acquaintance, both practical and scientific, with everything connected with the management of a Dairy, and the manufacture of Butter and Cheese.

(2) A general knowledge of the management of a Dairy Farm, including the rearing and feeding of Dairy Stock.

(3) Practical skill in Dairying, to be tested by the making of Butter and Cheese.

(4) Capacity for imparting instruction to others.

8. To qualify for admission to the Examination, a candidate must produce satisfactory evidence of having taken part in practical Dairy work upon a farm for a period of not less than twelve months. Three months at a Dairy Institute may count as if spent upon a farm.

9. The Board reserve the right to postpone, to abandon, or in any way, or at any time, to modify an Examination, and also to decline at any stage to admit any particular candidate to the Examination.

By Order,

ERNEST CLARKE,
Secretary, Royal Agricultural Society of England,
13 Hanover Square, London, W.

JAMES MACDONALD,
Secretary, Highland and Agricultural Society of Scotland,
3 George IV. Bridge, Edinburgh.

SYLLABUS OF SUBJECTS OF EXAMINATION.

I.—GENERAL MANAGEMENT OF A DAIRY FARM.

1. *General Management of Pastures and Crops on a Dairy Farm.*

2. *Buildings.*—Situation, Surroundings, Construction, Ventilation, and Drainage of Farm Buildings. Suitability of building materials. Water supply. Construction and arrangements of Dairies: (*a*) for General Purposes; (*b*) for Special Purposes.

3. *Foods and Feeding.*—Summer and Winter Feeding of Dairy Cattle. Root crops. Green fodder. Ensilage. Different kinds of food and their composition. Their effect upon Milk, Butter, and Cheese. Special Foods used in Dairy Feeding. Preparation of food for Dairy Stock. Rearing and feeding of young Stock. Feeding and management of Pigs and Poultry.

4. *Dairy Cattle in Health and Disease.*—Characteristics of different Breeds, and choice of Dairy Cattle. General functions of the organs of the animal body. Breeding. Parturition. Organs which secrete milk. Process of milk secretion. Changes which food undergoes during digestion. Diseases of Dairy Cattle and their remedies.

II.—MANAGEMENT OF A DAIRY.

1. *Milk and Cream.*—Process of Milking. Dairy Utensils and Appliances, hand and power. Cooling of Milk. Separation and ripening of Cream. Different systems of Cream-raising. Utilisation of Skim-milk. Keeping of Milk. Importance of Cleanliness. Diseases spread by Milk. Conveyance and sale of Milk. Milk records. Keeping of Dairy and Farm Accounts. Creameries. Butter and Cheese Factories. Different systems of Dairying and their comparative returns.

2. *Butter.*—Churns and other Butter-making appliances, hand and power. Souring of Cream. Churning. Washing and working of Butter. Butter-milk. Packing and transmission of Butter. Salting and keeping of Butter. Colouring. Characteristics of good Butter.

3. *Cheese.*—Principles of its manufacture. Making of different kinds of Cheese (from cream, whole-milk, and skim-milk). Acidity of Milk. Use of Rennet and its substitutes. Whey. Appliances for Cheese-making. Ripening and storage of Cheese. Packing and sale of Cheese. Making of Cream and other soft Cheeses.

III.—CHEMISTRY AND BACTERIOLOGY.

Nature, composition, properties, and chemical constituents of Milk. Microscopical appearances. The changes which take place in Milk, and how produced. Circumstances affecting the quality and quantity of Milk. Influence of temperature. Chemical changes involved in keeping and souring of Milk and in the formation of Butter and Cheese. Taints, Fermentation, and Putrefaction. The use of Preservatives. Milk testing and analysis. Detection of adulteration in Milk, Cream, Butter, and Cheese.

Nature and functions of Bacteria. The commoner forms of Bacteria taking part in the operations of the Dairy.

IV.—PRACTICAL SKILL IN DAIRY WORK.

Candidates must be prepared—(1) to produce at or before the Examination a satisfactory certificate of proficiency in the Milking of Cows, signed by a practical Dairy Farmer; (2) to churn and make into Butter a measured quantity of Cream; and (3) to make one Cheese of each of the following varieties: (i) Hard-pressed, of not less than 30 lb.; (ii) Veined or blue-moulded, of not less than 10 lb.; and (iii) also to make one or other of the following Soft Cheeses: Camembert, Coulommier, Gervais, or Pont l'Evêque.

V.—CAPACITY FOR IMPARTING INSTRUCTION TO OTHERS.

Candidates must also show practically that they are familiar with the management of a Dairy, and are capable of imparting instruction to others.

EXAMINATIONS IN 1900.

ENGLAND—About the last week in September; last date for receiving applications, 31st August.

SCOTLAND—Monday, October 1, to Friday, October 5, at Kilmarnock; last date for receiving applications, 31st August.

The following obtained the Diploma in Scotland in 1899:—

Fleming, Christina D., Hawkwood, Strathaven, Lanarkshire.
Limond, William, Broompark, Glenluce.
Macdonald, Mary, 26 Old Edinburgh Road, Inverness.
Stevenson, William, Boghead, Mauchline, Ayrshire.
Wilson, Bessie Lennox, Finlayston, Ochiltree.

The following obtained the Diploma in England in 1899:—

Ashby, Maud P., 110 Liverpool Road, Birkdale, Southport.
Brown, Bessie Lyon, Drumgley, Forfar.
Logan, Andrew, Midland Dairy Institute, Kingston Fields, Derby.
M'Duff, Christina M. B., British Dairy Institute, Reading.
Nickson, George Bernard, The Park Farm, Prestwick, near Manchester.
Orr, Dora, The Harris Institute, Preston.

EXAMINATION PAPERS

The following are the Papers for the Examination in Scotland in 1899 :—

N.B.—*The answers are to be written upon one side only of the sheets supplied. The candidate is required to write his or her* Number *upon each sheet at the right-hand top corner; to see that the sheets are paged consecutively in the centre at the top of each sheet; and at the close of the Examination to fasten the sheets together at the left-hand top corner, care being taken in so doing not to cover up the numbers of any questions answered.*

The Name of the Candidate is not to be Written upon any of the Sheets.

QUESTIONS IN GENERAL DAIRYING.

Maximum Number of Marks, 200. Pass Number, 100.

(*Three hours allowed.*)

N.B.—*Nos.* 1, 2, 3, *and* 4, *and at least other six questions, must be attempted.*

1. You are asked to select a Dairy Farm of about 160 acres. Describe the kind of farm you would look for, stating the district, position, and the system of dairying you have in view. Suggest a suitable rotation of crops, and state what would be a desirable acreage to have under Hay, Pasture, and Roots.

2. Describe and compare the selection and feeding of the stock of milch cows in the following systems of dairying: (*a*) Where the milk is sold as new milk; (*b*) where the whole-milk is ripened and butter is made; (*c*) where cheese is made.

3. Describe in detail what you would recommend as the best system of ripening whole-milk where churning is done three times a-week.

4. Describe any two systems of ripening cream. What changes take place during the process, and how would you control the ripening in each case?

5. Give the points of a good milch cow, and the characteristic points of *one* well-known breed of milch cows.

6. Give an average amount of crop and value per acre, and also the value per quarter or per ton, of the following crops: (*a*) Beans; (*b*) Oats; (*c*) Potatoes; (*d*) Ryegrass and Clover Hay.

7. Describe a good and thorough system of preparing and sweetening wooden milk-vessels which are mouldy and out of condition so as to make them suitable for use in a butter-making dairy.

8. State fully how you would feed and manage a dairy cow for 10 days before calving and one week after calving.

9. Name a few of the diseases easily conveyed by milk to human beings, and state in each case the precautions you would insist on in dealing with these diseases.

10. What precautions should be taken in working butter? State the most common results which follow from careless working.

11. Describe the process of milking, and state the results you might expect to follow when the work is badly done.

12. Describe fully an approved method of making one of the well-known soft cheeses.

QUESTIONS IN CHEMISTRY AND BACTERIOLOGY.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

(*Three hours allowed.*)

N.B.—*Nos.* 1, 2, 3, 7, 8, *and at least other two questions, must be attempted.*

1. Explain the processes of oxidation and reduction, and give two important examples of each.
2. What is meant by a salt? Distinguish between an acid salt, a basic salt, and a normal salt, and give an example of each, and show how it may be made.
3. How is carbonate of soda made? What occurs when a solution of carbonate of soda is added to each of the following substances—lime-water, gypsum, vinegar, sour milk?
4. What substance is formed when sulphur is burned in the air? What are its chief physical and chemical properties? To what use may it be put in dairy practice?
5. Give roughly the percentage composition of casein and of milk sugar. By what tests would you detect their presence in a sample of milk? How would you extract them from milk?
6. What are the chief mineral substances contained in milk? Which of them is of the most importance in enabling rennet to form a curd, and how would you explain its action?
7. Distinguish between a mould, a yeast, and a bacterium.
8. What is a ferment? Mention three distinct kinds of ferments, and enumerate the products formed by their fermentative action.
9. Describe minutely the changes that occur in the souring of milk.
10. If you suspected a sample of milk to be subject to a bacterial disease, how would you proceed to prove the matter?

QUESTIONS IN CHEESE-MAKING.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

(*Three hours allowed.*)

N.B.—Ten *questions must be attempted.*

1. What is the first essential point in the manufacture of first class cheese of any kind? Where should it begin? And what do you expect to find in all well-regulated byres during milking-time?
2. Which do you think pays the farmer best during the summer months, milk sent by rail at 5d. a gallon clear, or cheese at $5\frac{1}{2}$d. a lb.? Give reasons for your answer.
3. Describe fully the manufacture of Stilton cheese, and the price per lb. you would expect for same when sold.
4. What are the characteristics of a prime Stilton cheese compared with a fine cheddar of the same age?
5. How do bacteria assist in cheese-making? Name some beneficial, and some otherwise, and how you would keep them under control at the different stages.

6. How would you treat milk for cheese-making which you know to be too acid in the morning, as compared with milk you know to be sweet, in the raising of temperature, addition of morning's milk, and quantity of rennet used?

7. What quantity of salt would you use for cheddar cheese, and in what circumstances would you vary it? What effect has it on the curd? And would you make any difference in the amount of salt used in May and September?

8. State how you know when the curd is ready to grind and to vat; and what would be the effect, on the one hand, of vatting it too soon, and on the other, of not vatting it soon enough?

9. What amount of pressure would you suggest for a 90-lb. cheddar cheese during the first two hours after putting to press? and how long would you be before you had the full pressure on? What is the object in pressing?

10. What good does bathing cheese do? When is the best time to do so? and what temperature ought the bath to be?

11. What are the causes of too much butter-fat being lost in the whey? How can it be prevented; and what effect has this loss on the cheese?

12. From 100 gallons of milk in September what amount of curd would you expect to have; the quantity of ripe cheese you could sell; and at what price? Compare this with butter made and sold from the same quantity of milk.

CHEMICAL DEPARTMENT

Chemist to the Society—Dr A. P. AITKEN, Chemical Laboratory, 8 Clyde Street, Edinburgh.

The object of the Chemical Department is to promote the diffusion of a knowledge of Chemistry as applied to agriculture among the members of the Society, to carry out experiments for that purpose, to assist members who are engaged in making local experiments requiring the direction or services of a chemist, to direct members in regard to the use of manures and feeding-stuffs, to assist them to put the purchase of these substances under proper control, and in general to consider all matters coming under the Society's notice in connection with the Chemistry of Agriculture.

MEMBERS' PRIVILEGES IN RESPECT OF ANALYSES.

The fees of the Chemist for analyses made for members of the Society shall, until further notice, be as follows:—

The estimation of *one* ingredient in a manure or feeding-stuff, . 5s.
The estimation of *two* or *more* ingredients in do. . 10s.

These charges apply only to analyses made for agricultural purposes, and for the sole and private use of members of the Highland and Agricultural Society who are not engaged in the manufacture or sale of the substances analysed.

Valuations of manures, according to the Society's scale of units, will be supplied if requested.

MISCELLANEOUS.

	£	s.	d.
Analysis of water[1] to determine purity, hardness, and fitness for domestic use (not more than one analysis per year for any one member),	£1	0	0
Analysis of agricultural products—hay, grain, ensilage, roots, &c.,	1	0	0
Milk, full analysis,	0	10	0
" partial "	0	5	0
Butter, full analysis,	0	10	0
" partial "	0	5	0
Cheese,	0	10	0
Limestone, giving the percentage of lime,	0	5	0
Limestone, complete analysis,	1	0	0
Analysis of soil, to determine fertility and recommendation of manurial treatment,	1	10	0
Complete analysis of soil,	2	10	0
Search for poisons in food or viscera,	2	0	0

Samples should be sent (carriage paid) to Dr A. P. Aitken, 8 Clyde Street, Edinburgh.

INSTRUCTIONS FOR SELECTING SAMPLES FOR ANALYSIS.

MANURES.

Four or more bags should be selected for sampling. Each bag is to be emptied out separately on a clean floor, worked through with the spade, and one spadeful taken out and set aside. The four or more spadefuls thus set aside are to be mixed together until a uniform mixture is obtained. Of this mixture one spadeful is to be taken, spread on paper, and still more thoroughly mixed, any lumps which it may contain being broken down with the hand. Of this mixture two samples of about half a pound each should be taken by the purchaser or his agent, in the presence of the

[1] Cases containing bottles for water samples and instructions for sampling are sent from the laboratory on application.

seller or his agent or two witnesses (due notice having been given to the seller of the time and place of sampling), and these samples should be taken as quickly as possible, and put into bottles or tin cases to prevent loss of moisture, and having been labelled, should be sealed by the samplers—one or more samples to be retained by the purchaser, and one to be sent to the chemist for analysis.

FEEDING-STUFFS.

Samples of feeding compounds should be taken in a similar manner.

Samples of cake should be taken by selecting three cakes, breaking each across the middle, and from the broken part breaking off a segment across the entire breadth of the cake. The three segments thus obtained should be wrapped up and sealed by the samplers, and sent for analysis as in the case of manures, and three duplicate segments similarly sealed and labelled should be retained by the purchaser.

SOILS.

Dig a little trench about two feet deep, exposing the soil and subsoil. Cut from the side of this trench horizontal scrapings of the soil down to the top of the subsoil. Catch these on a clean board, and collect in this manner about one pound weight of soil taken from the whole surface of the section. Similar scrapings of subsoil immediately below should be taken and preserved separately. Five or six similarly drawn samples should be taken from different parts of the field, and kept separate while being sent to the chemist, that he may examine them individually before mixing in the laboratory.

VEGETABLE PRODUCTS.

Turnips, &c., 40 bulbs carefully selected as of fair average growth.

Hay, straw, ensilage, &c., should be sampled from a thin section cut across the whole stack or silo, and carefully mixed about; about 2 lb. weight is required for analysis.

Grain should be sampled like manures.

DAIRY PRODUCE.

Milk.—Samples of milk from individual cows should be taken direct from the milk-pail. Average samples from a number of cows should be taken immediately after milking. Samples to be tested for adulteration should not be drawn from the bottom or taken from the top of standing milk, but they should be ladled from the vessel after the milk has been thoroughly mixed.

For most purposes a pint bottle of milk is a large enough sample.

Butter and Cheese.—About quarter-pound samples are required.

WATERS.

When the water is from a well, it should be pumped for some minutes before taking the sample.

If the well has been standing unused for a long time, it should be pumped for some hours, so that the water may be renewed as far as possible.

If the well has been newly dug or cleaned out, it should be pumped as dry as possible, daily, for a week before taking the sample.

Water from cisterns, tanks, ponds, &c., should be sampled by immersing the bottle entirely under the water, and holding it, neck upwards, some inches below the surface. *Water from the surface should not be allowed to enter the bottle.*

Spring or stream water should not be sampled in very wet weather, but when the water is in ordinary condition. Such waters should be sampled by immersing the bottle, if possible; but if not deep enough for that pur-

pose, a perfectly clean cup should be used for transferring the water to the bottle.

When the bottle has been filled the stopper should be rinsed in the water before replacing it.

Interference with or disturbance of wells or springs, or the ground in their immediate vicinity, must be carefully avoided during sampling, and for at least twenty-four hours before it.

After a sample has been taken, it should be sent to the laboratory as speedily as possible.

A description of the source and circumstances of the water should accompany the sample, as the interpretation of the analytical results depends to some extent on a knowledge of such particulars.

N.B.—Stone jars and old wine bottles are unsuitable for conveying samples. Winchester quarts chemically cleaned should be obtained from the laboratory here.

LOCAL ANALYTICAL ASSOCIATIONS.

With the view of encouraging, as well as regulating the conduct of, Local Analytical Associations, the Society, from 1881 to 1893, contributed from its funds towards their expenses a sum not exceeding £250 annually. In view of the passing of the Fertilisers and Feeding Stuffs Act, 1893, it was decided, at a meeting of the Directors on the 6th of December 1893, to discontinue that grant after the 1st of March 1894.

COMPOSITION AND CHARACTERISTICS OF MANURES AND FEEDING-STUFFS.

(*See* '*Transactions*,' *Fifth Series, vol. xi.* 1899.)

FORMS OF GUARANTEE

Guarantee of Manure.

I guarantee that the manure called......................and sold by me to ....contains a minimum of—

Soluble phosphoric acid =Phosphate of lime dissolved .... per cent.
Insoluble phosphoric acid=Phosphate of lime undissolved ....per cent.
Potash salts . . =Potash (K_2O) . . . .per cent.
Total nitrogen . . =Ammonia . . . .per cent.

Signature of seller........................

Date.................18...

Guarantee of Feeding-Stuff.

I guarantee that the feeding-stuff called...............and sold by me to ....contains a minimum of—

.... per cent albuminoids.
.... per cent oil.
.... per cent carbohydrates.

Signature of seller........................

Date.................18...

UNITS TO BE USED IN DETERMINING THE COMMERCIAL VALUE OF MANURES.[1]

Terms—CASH, including Bags gross weight—not including Carriage.

N.B.—These units are based on the present RETAIL PRICES at principal seaports. When these units are multiplied by the percentages in the analysis of a Manure, they will produce a value representing very nearly the cash price at which one SINGLE TON may be bought in fine sowable condition. Larger purchases may be made on more favourable terms.

For Session 1900.

CASH PRICES as Fixed on 1st February.

Items to be Valued.	Peruvian (Riddled).	Bone-Meal.	Steamed Bone Flour.	Dissolved or Vitriolated Bones.	Superphosphates. Under 30°/o Sol. Phos.	Superphosphates. Over 30°/o Sol. Phos.
	P unit	P unit	P. unit	P unit.	P unit.	P. unit
Phosphates dissolved	1/6	..	..	3/-	1/11	1/10
" undissolved		1/3	1/3	1/3	..	..
Nitrogen	17/-	12/-	12/-	12/-	..	..
or Ammonia	14/-	10/-	10/-	10/-	..	..
Prices per ton, Feb. 1, 1900 From	100/-	110/-	95/-	105/-	45/-	55/-
to	180/-	120/-	100/-	110/-	55/-	65/-

Manures.	Guarantee.	Price per Ton.	Unit.
	Per cent.	£ s. d.	
Sulphate of ammonia[2]	21 Ammonia	12 0 0	Am. = 10/-
Nitrate of soda, 95 per cent[2]	19 "	8 0 0	" = 8/5
Muriate of potash, 80 per cent	50 Potash	8 15 0	Pot. = 3/6
Sulphate of potash, 50 per cent	27 "	5 0 0	" = 3/9
Kainit	12 "	2 0 0	" = 3/4
Thomas-slag phosphate	30 Phosphate	1 15 0	Phos. = 1/2

[1] Instructions regarding units and the valuation of manures are given on p. 36.
[2] Subject to constant variation.

FEEDING-STUFFS.	Analyses.			Price per Ton in bags.
	Album.	Oil.	Carbo-hydrates.	£ s. d.
Linseed-cake	28	9	35	8 10 0
" Canadian	28	8	35	7 12 6
Decorticated cotton-cake	45	10	20	6 12 6
Undecorticated do.	24	7	25	5 5 0
Bean-meal[1]	25	2	50	7 4 0
Locust-bean meal	6	2	70	6 5 0
Dried Distillery grains	20	8	50	5 0 0
Barley-bran	15	5	50	4 15 0
Indian corn[1]	10	5	55	4 2 6
Paisley meal	15	9	60	4 15 0
Linseed (whole)	20	35	14	15 0 0
Linseed-oil	..	..	..	24 0 0
Molasses	..	..	..	4 2 6

[1] Subject to constant variation.

CLASSIFICATION OF MANURES.

Bone-meal . . .	Genuine bone-meal contains from 48 per cent to 55 per cent phosphates, and from 3½ per cent to 4 per cent nitrogen. If phosphates are low nitrogen will be high, and conversely.
Steamed bone-flour .	Ground to flour and containing about 60 per cent phosphates, and about 2 per cent nitrogen.
Dissolved bones . .	Must be pure—*i.e.*, containing nothing but natural bones and sulphuric acid.
Mixtures . . .	To be valued according to the unit values (as given above) of the ingredients of which they are guaranteed *and also found* to be composed, with an addition of from 5 to 10 per cent, according to the fineness of their manufacture.
Thomas-slag . . .	Fineness of grinding is of paramount importance. The coarsest kind used should be so finely ground that 80 per cent passes through a sieve of 10,000 holes per sq. inch.

INSTRUCTIONS FOR VALUING MANURES.

The unit used for the valuation of manures is the hundredth part of a ton, and as the analyses of manures are expressed in parts per hundred, the percentage of any ingredient of a manure when multiplied by the price of the unit of that ingredient represents the value of the quantity of it contained in a ton.

As an example take muriate of potash—a good sample (see p. 34) will be guaranteed to contain 80 per cent *pure* muriate of potash; the other 20 per cent consisting of unimportant impurities such as common salt. But all potash manures are valued according to the amount of POTASH they yield, and 80 per cent of pure muriate of potash yields 50 per cent potash (K_2O)—*i.e.*, 50 units per ton, and as a ton of muriate of potash costs £8, 15s. the price of the unit is the fiftieth part of that—viz., 3s. 6d. If on analysis a sample of muriate of potash guaranteed to contain 50 per cent of potash is found to contain only 49 per cent, the price per ton will be 3s. 6d. less—viz, £8, 11s. 6d.

Similarly with all other manures the price per unit is derived from the price per ton of a sample of good material up to its guarantee, and therefore the proper price per ton of a manure is found by multiplying the price of the unit of the valuable ingredient by the percentage as found by analysis. If a manure contains more than one valuable ingredient the unit value of each ingredient is multiplied by its percentage, and the values so found when added together give approximately the price per ton of the manure.

Nitrate of soda contains no ammonia but it contains nitrogen, and 14 units of nitrogen are equivalent to 17 units of ammonia, and it is the custom in Scotland to value all nitrogenous manures not according to the nitrogen they contain but according to its equivalent of ammonia.

The commercial values of manures are determined by means of the UNITS in the following manner:—

Take the analysis of the manure, and look for the following substances:—

Phosphates dissolved (or soluble phosphate)	No other items but these are to be valued.
" undissolved (or insoluble ")	
Nitrogen = Ammonia	
Potash	

Should the analysis or the guarantee not be expressed in that way, the chemist or the seller should be asked to state the quantities in these terms.

Suppose the manure is bone-meal:—

An ordinary bone-meal will contain about 50 per cent phosphate and nearly 4 per cent nitrogen. The units for bones are 1s. 3d. for phosphate and 12s. for nitrogen. Therefore the value is—

	£	s.	d.
Insol. phosphate, 50 times 1s. 3d., equal to	£3	2	6
Nitrogen, 3·7 " 12s., (or $4\frac{1}{2}$ ammonia at 10s.), equal to	2	5	0
Say	£5	7	6 per ton.

Suppose the manure is dissolved or vitriolated bones:—

It must be guaranteed "pure."

The units in the Schedule are 3s. for soluble phosphate, 1s. 3d. for insoluble phosphate, and 12s. for nitrogen.

The analysis will be about 16 per cent soluble phosphate, 20 per cent insoluble phosphate, and $2\frac{1}{2}$ per cent nitrogen. In that case the value would be—

Sol. phosphate, 16 times 3s., equal to	£2	8	0	
Insol. „ 20 „ 1s. 3d., „	1	5	0	
Nitrogen, $2\frac{1}{2}$ „ 12s., (or 3 ammonia at 10s.), equal to	1	10	0	
Say	£5	3	0	per ton.

Suppose the manure is a superphosphate,—say an ordinary superphosphate, with 28 per cent soluble phosphate and 3 per cent insoluble phosphate. It is valued thus:—

Sol. phosphate, 28 times 1s. 11d., equal to, say, £2, 13s. 8d. per ton.
Insoluble phosphate is not valued in a superphosphate.

Note.—The units have reference solely to the Commercial Values of Manures, and not to their Agricultural Values.

Thus, in stating soluble phosphate in dissolved bones at 3s. per unit, and that in superphosphate at 1s. 10d., it is meant that these are the prices per unit at which soluble phosphate can be bought in these two manures; but it does not mean that the soluble phosphate in the one is 1s. 2d. per unit better as a manure than that in the other. It is probably no better.

BOTANICAL DEPARTMENT

Consulting Botanist to the Society—A. N. M'Alpine,
60 John Street, Glasgow.

The Society have fixed the following rates of charge for the examination of plants and seeds for the *bona fide* and individual use and information of members of the Society (not being seedsmen), who are particularly requested, when applying to the Consulting Botanist, to mention the kind of examination they require, and to quote its number in the subjoined schedule. The charge for examination must be paid at the time of application, and the carriage of all parcels must be prepaid.

Scale of Charges.

1. A report on the purity, amount, and nature of foreign materials, 2s.
2. On the germinating power of a sample of seed, 2s.
3. Determination of the species of any weed or other plant, or of any vegetable parasite, with a report on its habits and the means for its extermination or prevention, 5s.
4. Report on any disease affecting farm crops, 5s.
5. Determination of the species of any natural grass or fodder plant, with a report on its habits and pasture or feeding value, 1s.

The Consulting Botanist's Reports are furnished to enable members—purchasers of seeds and corn for agricultural purposes—to test the value of what they buy, and are not to be used or made available for advertising or trade purposes by seedsmen or otherwise.

Instructions for Selecting and Sending Samples.

In sending seed or corn for examination, the utmost care must be taken to secure a fair and honest sample. In the case of grass seeds, the sample would be drawn from the centre of the sack or bag, and in all cases from the bulk delivered to the purchaser. If anything supposed to be

injurious or useless exists in the corn or seed selected, samples should also be sent.

When possible, at least one ounce of grass and other small seeds should be sent, and two ounces of cereals or larger seeds. The exact name under which the seed has been bought (but preferably, a copy of the invoice) should accompany the sample.

Grass seeds should be sent at least four weeks, and clover seeds three weeks, before they are to be used.

In collecting specimens of plants, the whole plant should be taken up and the earth shaken from the roots. If possible, the plants must be in flower or fruit. They should be packed in a light box, or in a firm paper parcel.

Specimens of diseased plants or of parasites should be forwarded as fresh as possible. Place them in a bottle, or pack them in tinfoil or oil-silk.

All specimens should be accompanied with a letter specifying the nature of the information required, and stating any local circumstances (soil, situation, &c.) which, in the opinion of the sender, would be likely to throw light on the inquiry.

It is strongly recommended that members purchasing seeds should insist—

(1) Upon having from the seller a guarantee stating the purity and germination of the seed supplied.

(2) That the bulk be same as sample.

(3) That it contain not more than 5 per cent other than the species ordered.

If the purity and germination of the seed is not known, it is impossible to tell either its money value or the proper amount to be sown.

It is also strongly recommended that the purchase of prepared mixtures should be avoided, and the different seeds to be used should be purchased separately.

Parcels or letters containing seeds or plants for examination (carriage or postage paid) must be addressed to Professor M'Alpine, Botanical Laboratory, 60 John Street, Glasgow.

INSECT PESTS.

Arrangements have been made with Mr R. Stewart MacDougall, M.A., D.Sc., Edinburgh, to advise members of the Society regarding insects or allied animals which, in any stage of their development, infest—

(*a*) Farm crops.
(*b*) Stored grain.
(*c*) Garden and greenhouse plants.
(*d*) Fruit and fruit trees.
(*e*) Forest trees and stored timber.
(*f*) Live stock (including poultry).

Members consulting Mr MacDougall will please forward with their queries examples of the injured plants, or the injured parts of plants, &c., as well as specimens of the insects or other animals believed to be the cause of the injury.

Specimens should be sent in tin or wooden boxes, or in quills, to prevent injury in transmission.

Address letters and parcels (carriage or postage paid) to R. Stewart MacDougall, 25 India Street, Edinburgh.

The Directors have fixed the fee payable by members to Mr MacDougall at 1s. for each case upon which he is consulted; this fee must be sent to him along with the application for information.

PREMIUMS

GENERAL REGULATIONS FOR COMPETITORS.

1. It is to be distinctly understood that the Society is not responsible for the views, statements, or opinions of any of the writers whose papers are published in the 'Transactions.'

2. All reports must be legibly written, and on one side of the paper only; they must specify the number and subject of the Premium for which they are in competition; they must bear a distinguishing motto, and be accompanied by a sealed letter, similarly marked, containing the name and address of the reporter—initials must not be used.

3. No sealed letter, unless belonging to a report found entitled to the Premium offered, or a portion of it, will be opened without the author's consent.

4. Reports for which a Premium, or a portion of a Premium, has been awarded, become the property of the Society, and cannot be published in whole or in part, nor circulated in any manner, without the consent of the Directors. All other papers will be returned to the authors if applied for within twelve months.

5. The Society is not bound to award the whole or any part of a Premium.

6. All reports must be of a practical character, containing the results of the writer's own observation or experiment, and the special conditions attached to each Premium must be strictly fulfilled. General essays, and papers compiled from books, will not be rewarded or accepted. Weights and measurements must be indicated by the imperial standards.

7. The Directors, before or after awarding a Premium, shall have power to require the writer of any report to verify the statements made in it.

8. The decisions of the Board of Directors are final and conclusive as to all matters relating to Premiums, whether for Reports or at General or District Shows; and it shall not be competent to raise any question or appeal touching such decisions before any other tribunal.

9. The Directors will welcome papers from any Contributor on any suitable subject not included in the Premium List; and if the topic and the treatment of it are both approved, the writer may be remunerated and his paper published.

CLASS I.

REPORTS.

SECTION 1.—THE SCIENCE AND PRACTICE OF AGRICULTURE.

FOR APPROVED REPORTS.

1. On any useful practice in Rural Economy adopted in other countries, and susceptible of being introduced with advantage into Scotland—The Gold Medal. To be lodged by 1st November in any year.

The purposes chiefly contemplated by the offer of this premium is to induce travellers to notice and record such particular practices as may seem calculated to benefit Scotland. The Report to be founded on personal observation.

2. Approved Reports on other suitable subjects. To be lodged by 1st November in any year.

SECTION 2.—ESTATE IMPROVEMENTS.

FOR APPROVED REPORTS.

1. By the Proprietor in Scotland who shall have executed the most judicious, successful, and extensive Improvement—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

Should the successful Report be written for the Proprietor by his resident factor or farm manager, a Minor Gold Medal will be awarded to the writer in addition to the Gold Medal to the Proprietor.

The merits of the Report will not be determined so much by the mere extent of the improvements, as by their character and relation to the size of the property. The improvements may comprise reclaiming, draining, enclosing, planting, road-making, building, and all other operations proper to landed estates. The period within which the operations may have been conducted is not limited, except that it must not exceed the term of the Reporter's proprietorship.

2. By the Proprietor or Tenant in Scotland who shall have reclaimed within the ten preceding years not less than forty acres of Waste Land—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

3. By the Tenant in Scotland who shall have reclaimed within the ten preceding years not less than twenty acres of Waste Land

—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

4. By the Tenant in Scotland who shall have reclaimed not less than ten acres within a similar period—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November in any year.

The Reports in competition for Nos. 3, 4, and 5 may comprehend such general observations on the improvement of waste lands as the writer's experience may lead him to make, but must refer especially to the lands reclaimed—to the nature of the soil—the previous state and probable value of the subject—the obstacles opposed to its improvement—the details of the various operations—the mode of cultivation adopted—and the produce and value of the crops produced. As the required extent cannot be made up of different patches of land, the improvement must have relation to one subject; it must be of profitable character, and a rotation of crops must have been concluded before the date of the Report. *A detailed statement of the expenditure and return* and a certified measurement of the ground are requisite.

5. By the Proprietor or Tenant in Scotland who shall have improved within the ten preceding years the Pasturage of not less than thirty acres, by means of top-dressing, draining, or otherwise, without tillage, in situations where tillage may be inexpedient—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

6. By the Tenant in Scotland who shall have improved not less than ten acres within a similar period—The Minor Gold Medal. To be lodged by 1st November in any year.

Reports in competition for Nos. 5 and 6 must state the particular mode of management adopted, the substances applied, the elevation and nature of the soil, its previous natural products, and the changes produced.

Section 3.—HIGHLAND INDUSTRIES and FISHERIES.

FOR APPROVED REPORTS.

1. The best mode of treating native Wool; cleaning, carding, dyeing, spinning, knitting, and weaving by hand in the Highlands and Islands of Scotland—Five Sovereigns. To be lodged by 1st November 1900.

Section 4.—MACHINERY.

FOR APPROVED REPORTS.

To be lodged by 1st November in any year.

SECTION 5.—FORESTRY DEPARTMENT.

FOR APPROVED REPORTS.

1. On Plantations of not less than eight years' standing formed on deep peat-bog—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November 1900.

The premium is strictly applicable to deep peat or flow moss; the condition of the moss previous to planting, as well as at the date of the Report, should, if possible, be stated.

The Report must describe the mode and extent of the drainage, and the effect it has had in subsiding the moss—the trenching, levelling, or other preliminary operations that may have been performed on the surface—the mode of planting—kinds, sizes, and number of trees planted per acre—and their relative progress and value, as compared with plantations of a similar age and description grown on other soils in the vicinity.

CLASS II.

DISTRICT COMPETITIONS.

REGULATIONS 1900.

The Money Premiums and Medals awarded at District Competitions will be sent direct to the winners in January next. No payments must therefore be made by the Secretary or Treasurer of any local Association.

Grants in aid of DISTRICT COMPETITIONS *for* 1901 *must be applied for before* 1*st November* 1900, *on Forms to be obtained from the Secretary.*

When a Grant has expired, the District cannot apply again for aid for two years.

SECTION I.—GRANTS TO DISTRICT SOCIETIES FOR HORSES, CATTLE, SHEEP, AND PIGS.

1. CLASS OF STOCK—LIMIT OF GRANTS, £340.—The Highland and Agricultural Society will make Grants to District Societies to deal with, as in the opinion of the District Societies the need of each district may require, for such classes of breeding Stock of Horses, Cattle, Sheep, and Pigs as are embraced in the General Show Prize List of the Highland and Agricultural Society. The total sum to be expended by the Highland and Agricultural Society in such Grants shall not exceed the sum of £340 in any one year.

2. GRANT TO DISTRICT, £12.—The portion of the Grant to any one District Society shall not exceed the sum of £12 in any one year.

3. Continuance of Grant Three Years—Advertising.—The Grant shall continue for three alternate years, provided always that the District Society shall, in the two intermediate years, continue the competition by offering Premiums equal in amount to not less than one-half the sum given by the Highland and Agricultural Society, and for the same class of Stock as that selected in each previous year to compete for the Highland and Agricultural Society's Prizes. The Prizes when given by the Highland and Agricultural Society must be announced as the Society's gift. If no competition takes place for two years the Grant expires.

4. When it is agreed to hold the General Show of the Society in any district, no provincial show shall be held in that district in the months of June, July, or August.

5. Medals.—In the two alternate years the Highland and Agricultural Society will place three Silver Medals at the disposal of the District Societies, for the same classes of Stock as those for which the Money Premiums are offered, provided that not less than three lots are exhibited in the same class.

6. Rules of Competition.—The Rules of Competition for the Premiums, the Funds for which are derived from Grants of the Highland and Agricultural Society, shall be such as are generally enforced by the Society receiving the Grant for Premiums offered by itself.

7. Area and Parishes—Five Parishes.—When making application for Grants from the Highland and Agricultural Society, the District Society must delineate the area and the number of parishes comprised in the district, and, *except in special cases*, no District Society shall be entitled to a Grant whose show is not open to at least *five* Parishes.

8. Nomination of Members.—The Directors may nominate one or more members of the Highland and Agricultural Society resident in the district, whose duty it shall be to see that the conditions imposed by the Board are complied with.

9. Reports.—Blank Reports will be furnished to the Secretaries of the different District Societies. These Reports must in all details be completed and lodged with the Secretary of the Highland and Agricultural Society on or before the 1st of November next following the competition, both in the years when the Grant is given and in the two intermediate years, for the approval of the Directors of the Highland and Agricultural Society, against whose decision there shall be no appeal. All such Reports must be signed and certified by the Members of the Highland and Agricultural Society nominated under Rule 8.

10. Grants—When Paid.—The Grants made to District Societies will be paid in the January following the competition, by Precepts issued by the Directors of the Highland and Agricultural Society to the winners of the prizes. No payments of these Grants must be made by the Secretary or Treasurer of any District Society. Medals will be issued at the same time.

11. Renewal of Application.—No application for renewal of a Grant to a District Society will be entertained until the expiration of *two years* from the termination of the last Grant.

12. Disposal of Applications.—In disposing of applications for District Grants, the Directors of the Highland and Agricultural Society shall keep in view the length of interval that has elapsed since the expiration of the last Grant, giving priority to those District Societies which have been longest off the list.

13. Dairy Produce.—Upon application being made by District Societies, a limited number of Medals will be placed at the disposal of District Societies for Dairy Produce.

DISTRICTS.

1. Buchan.—*Convener*, William Ainslie, Taitswell, Mintlaw; *Secretaries*, J. & J. A. Smith, Town and County Bank, Strichen. Granted 1896.
2. Royal Northern.—*Convener*, George J. Walker, Portlethen, Aberdeen; *Secretary*, R. R. Ross, 35 Market Street, Aberdeen. Granted 1896.
3. Mid-Annandale.—*Convener*, James Lindsay, Whitecastles, Lockerbie; *Secretary*, John A. Mackenzie, Solicitor, Lockerbie. Granted 1896.
4. Dalkeith.—*Convener*, George Pendreigh, Upper Balhousie, Lasswade; *Secretary*, Archd. Dods, Auctioneer, Dalkeith. Granted 1895. (In abeyance in 1899 on account of the Edinburgh Show.)
5. Inverurie.—*Convener*, John Tait, Crichie, Inverurie; *Secretary*, Granted 1898.
6. Kintyre.—*Convener*, Com. D. Stewart, R.N., Knockrioch, Campbeltown; *Secretary*, G. Erskine Inglis, Campbeltown. Granted 1898.
7. St Mary's Isle Estates and District.—*Convener*, Col. Robt. F. Dudgeon, The Grange, Kirkcudbright; *Secretary*, John Gibson, Solicitor, Kirkcudbright. Granted 1898.
8. Carnwath.—*Convener*, William Fleming, Calla, Carnwath; *Secretary*, John Robertson, Banker, Carnwath. Granted 1898.
9. Wester Ross.—*Convener*, P. B. Macintyre, Mains of Findon, Conon Bridge; *Secretary*, Ben. Aird, Banker, Dingwall. Granted 1898.
10. Stranraer and Rhins of Galloway.—*Convener and Secretary*, John Bennoch, Solicitor, Stranraer. Granted 1898. (3 Medals along with Grant in 1900.)
11. Formartine.—*Convener*, David Walker, Coullie, Udny, Aberdeen; *Secretary*, Thos. H. Gibson, Cultercullen, Aberdeen. Granted 1900.
12. Dunoon.—*Convener*, John Mercer, Ardnadam, Sandbank; *Secretary*, John Dobie, Clydesdale Bank, Dunoon. Granted 1900.
13. Girvan.—*Convener*, John Stevenson, Woodland, Girvan; *Secretary*, Andrew Dunlop, Royal Bank, Girvan. Granted 1900.
14. Moffat and Upper Annandale.—*Convener*, James Johnstone, Hunterheck, Moffat; *Joint-Secretaries*, John Young, Michael Johnstone, and William Tait, Moffat. Granted 1900.
15. Glenkens.—*Convener*, John W. Hutchison of Laurieston Hall, Laurieston; *Secretary*, James M'Gill, New Galloway. Granted 1900.
16. East Kilbride.—*Convener*, James M'Meeken, Carnboth, Busby; *Secretary*, William Strang, 103 West Regent Street, Glasgow. Granted 1900.
17. Atholl and Weem.—*Convener*, Alex. Robertson, Ballechin, Ballinluig; *Secretary*, Hugh Mitchell, Pitlochry. Granted 1900.
18. Lower Ward of Renfrewshire.—*Convener*, H. R. B. Peile, Mansion House, Greenock; *Secretary*, Robert Steuart Walker, 11 William Street, Greenock. Granted 1900.
19. Nithsdale.—*Convener*, William Barber, Tererran, Moniaive; *Secretary*, Robert Wilson, Solicitor, Thornhill. Granted 1897.
20. Kirriemuir.—*Convener*, T. M. Nicoll, Littleton, Kirriemuir; *Secretary*, Stewart Lindsay, Crawford Park, Kirriemuir. Granted 1897.
21. Sutherland.—*Convener*, R. R. Hill, Navidale House, Helmsdale; *Secretary*, J. Mackintosh, Proncy, Dornoch. Granted 1897.
22. West of Scotland Union.—*Convener and Secretary*, John Watson, National Bank, Crosshill, Glasgow. Granted 1899.
23. Lammermoor Pastoral.—*Convener and Secretary*, Thomas Stephenson, Chapel, Duns. Granted 1899.

24. Stirling.—*Convener*, James M'Farlane of Oxhill, Bucklyvie; *Secretary*, Andrew C. Buchanan, 26 Port Street, Stirling. Granted 1899. (In abeyance in 1900 on account of the Stirling Show.)
25. Breadalbane. — *Convener*, Thomas Watters, Glenample, Lochearnhead; *Secretary*, Duncan Campbell, Dundaramh, Killin. Granted 1898. (In abeyance in 1900 on account of the Stirling Show.)

In 1900

Nos. 1, 2, 3, and 4 are in competition for the last year.

Nos. 5, 6, 7, 8, 9, and 10 are in competition for the second year.

Nos. 11, 12, 13, 14, 15, 16, 17, and 18 are in competition for the first year.

Nos. 19, 20, 21, 22, and 23 compete for local Premiums.

Nos. 24 and 25 are in abeyance on account of the Stirling Show.

Section 2.—GRANTS TO HORSE ASSOCIATIONS, &c., FOR STALLIONS FOR AGRICULTURAL PURPOSES.

1. Horses—Limit of Grant, £210.—The Highland and Agricultural Society will make Grants to Horse Associations and other Societies in different districts engaging Stallions for agricultural purposes. The total sum expended by the Highland and Agricultural Society in such Grants shall not exceed the sum of £210 in any one year.

2. Grant to each, £15.—The portion of the Grant to any one Horse Association, &c., shall not exceed the sum of £15 in any one year.

3. Continuance of Grant Three Years—Intermediate Year.—The Grant shall continue for three alternate years, provided always that the Horse Association or Society shall, in the two intermediate years, offer at least a sum equal in amount to that granted by the Highland and Agricultural Society for the hire of a Horse in connection with the Association or Society to whom the Grant is made.

4. Nomination of Members.—The Directors of the Highland and Agricultural Society shall nominate one or more members of the Highland and Agricultural Society, resident in the Districts in which the Society benefited is located, whose duty it shall be to see that the conditions imposed by the Board are complied with.

5. Reports—Penalty for not engaging Horse.—No Grant by the Highland and Agricultural Society to Horse Associations, &c., will be paid unless a report, signed and certified by the members appointed under Rule 4, be furnished to the Highland and Agricultural Society not later than the 1st of November in each year in which the Grant is made, and also in the alternate years, stating that a Horse has been engaged by the Horse Association or other Society to whom the Grant is made; and in the event of a Horse not being engaged in any one year while the provisions of the Grant are in force, the Grant made by the Highland and Agricultural Society will cease.

6. Rules 10 (Time of Payment), 11 (Renewal of Grant), and 12 (Disposal of Applications) applicable to Section 1, shall be applicable to Section 2.

DISTRICTS.

1. Western District of Mid-Lothian. — *Convener*, A. Alexander, Cockburnhill, Balerno; *Secretary*, John T. Mungle, Commercial Bank of Scotland, West Calder. Granted 1896.

2. Stirling District Horse Society.—*Convener*, Colonel Murray of Polmaise, Stirling; *Secretary*, Robert Paterson, Hill of Drip, Stirling. Granted 1896.
3. Dumbartonshire Horse-Breeding Society.—*Convener*, Charles W. Ralston, Garscube, Maryhill; *Secretary*, William Reid, 140 St Vincent Street, Glasgow. Granted 1898.
4. Selkirk and Galashiels.—*Convener*, John Dun, Craigpark, Galashiels; *Secretary*, David C. Finlay, Elm Cottage, Galashiels. Granted 1898.
5. Nairnshire.—*Convener*, J. S. Robertson, Cawdor Estate Office, Nairn; *Secretary*, J. A. Robertson, Royal Stables, Nairn. Granted 1900.
6. Newton-Stewart Horse-Breeding Society.—*Convener and Secretary*, William M'Connell, Glasnick, Kirkcowan. Granted 1900.
7. West Fife Clydesdale Horse Society. — *Convener*, James Law, Spencerfield, Inverkeithing; *Secretary*, James Millar, Waulkmill, Dunfermline. Granted 1897.
8. Carse of Gowrie and Dundee District Stallion Society.—*Convener*, Capt. Clayhills Henderson of Invergowrie, R.N., Dundee; *Secretary*, Alex. Anderson, Berryhill, Dundee. Granted 1897.
9. Kilfinan.—*Convener*, Duncan Thomson, Inveryne, Tighnabruaich; *Secretary*, Neil Nicolson, Auchgoyle, Tighnabruaich. Granted 1899.
10. Fyvie.—*Convener*, William Mackie, Lewes, Fyvie; *Secretary*, John Hay, Mill of Crichie, Fyvie. Granted 1899.
11. Kinross-shire.—*Convener*, Henry J. Montgomery of Hattonburn, Milnathort; *Secretary*, John Hay, Balleave, Kinross. Granted 1899.
12. Glenkens, Balmaghie, and Parton.—*Convener*, W. A. M'Turk, Barlae, Dalry, Galloway; *Secretary*, Robt. T. Scott, Drumhumphrey, Corsock, Dalbeattie. Granted 1899.
13. Machars.—*Convener*, William Smith, Garrarie, Portwilliam; *Secretary*, Charles M. Routledge, British Linen Co. Bank, Portwilliam. Granted 1899.

In 1900.

Nos. 1 and 2 are in competition for the last year.
Nos. 3 and 4 are in competition for the second year.
Nos. 5 and 6 are in competition for the first year.
Nos. 7, 8, 9, 10, 11, 12, and 13 compete for local premiums.

DAIRY PRODUCE.

Upon application being made by District Societies, a limited number of Silver Medals will be placed at the disposal of District Societies for Dairy Produce.

The Medals are granted for two years, and lapse if not awarded in those years.

SPECIAL GRANTS.

£40 to the Highland Home Industries Association. — *Secretary*, Miss Muriel K. Mackenzie, Conon House, Conon Bridge, Ross-shire. (Did not hold a Competition in 1899.)

£20 to the Ayrshire Agricultural Association, to be competed for at the Dairy Produce Show at Kilmarnock.—*Convener*, The Hon. G. R.

Vernon, Auchans House, Kilmarnock; *Secretary*, John Howie, Wellington Chambers, Ayr. Granted 1872.

£5 to Shetland Agricultural Society.—*Convener*, John Bruce of Sumburgh, Lerwick; *Secretary*, J. Wilson, Commercial Bank, Lerwick. Granted 1893.

£3 to Orkney.—*Secretary*, James Johnston, Orphir House, Orkney. Granted 1883.

£3 to East Mainland, Orkney.—*Convener*, Alfred Reid, Braebuster, Kirkwall; *Secretary*, John Cumming, Sebay, St Andrews, Orkney. Granted 1898.

£3 to West Mainland, Orkney.—*Convener*, W. G. T. Watt, Skaill House, Stromness; *Secretary*, Robert Gibson, Lochside, Stenness, Stromness. Granted 1900.

MEDALS IN AID OF PREMIUMS GIVEN BY LOCAL SOCIETIES.

The Society, being anxious to co-operate with local Associations, will give a limited number of Silver Medals annually to Societies, not on the list of Cattle, Horse, or Sheep Premiums, in addition to the Money Premiums awarded in the Districts for—

1. Best Bull, Cow, Heifer of any pure breed, or Ox.
2. Best Stallion, Mare, or Gelding.
3. Best Tup, or Pen of Ewes or Wethers.
4. Best Boar, Sow, or Pig.
5. Best Pens of Poultry.
6. Best Sample of any variety of Wool.
7. Best Sample of any variety of Seeds.
8. Best managed Farm.
9. Best managed Green Crop.
10. Best managed Hay Crop.
11. Best managed Dairy.
12. Best Sweet-Milk Cheese.
13. Best Cured Butter.
14. Best collection of Roots.
15. Best kept Fences.
16. Male Farm Servant who has been longest in the same service, and who has proved himself most efficient in his duties, and to have invariably treated the animals under his charge with kindness.
17. Female Servant in charge of Dairy and Poultry who has been longest in the same service, and who has proved herself most efficient in her duties, and to have invariably treated the animals under her charge with kindness.
18. Best Sheep-Shearer.
19. Most expert Hedge-Cutter.
20. Most expert Labourer at Draining.
21. Most expert Farm Servant at trial of Reaping-Machines.
22. Best Maker of Oat-Cakes.

It is left to the local Society to choose out of the foregoing list the classes for which the Medals are to be competed.

The Medals are granted for two years, and lapse if not awarded in those years.

In 1889 it was resolved that in future no Society shall receive more than two Medals for two years.

Aberdeenshire.

1. Cluny, Monymusk, and Midmar.—*Convener,* Ranald Macdonald, Cluny Castle, Aberdeen; *Secretary,* James Christie, Backhill, Cluny, Kemnay. 2 Medals. 1900.
2. Deeside Union.—*Convener,* Lt.-Col. F. N. Innes of Learney, Torphins, Aberdeen; *Joint-Secretaries,* John Davidson, Harestone, Banchory, and John Cooper, Ley, Banchory. 2 Medals. 1900.
3. Ebrieside.—*Convener,* John Grant, Banker, Methlick; *Secretary,* William Johnston, Loanhead, Savoch, Ellon. 2 Medals. 1899.
4. Garioch.—*Convener,* Alex. M. Gordon of Newton, Insch; *Secretary,* George A. Bruce, Inschfield, Insch. 2 Medals. 1899.
5. Kennethmont.—*Convener,* William A. Mitchell, Auchnagathel, Keig; *Secretary,* James R. Moir, 22 Belmont Road, Aberdeen. 2 Medals. 1898. (Continued for 1900.)
6. Mar.—*Convener,* George Still, Strathray, Kinaldie; *Secretary,* Sylvester Campbell, Kinellar, Kinaldie. 2 Medals. 1900.
7. North of Scotland Root, Vegetable, &c.—*Convener,* John Maitland, East Balhalgardy, Inverurie; *Secretary,* Alex. Greig, Paradise, Inverurie. 4 Medals. 1899.
8. Strichen.—*Convener and Secretary,* John Sleigh, Strichen Mains, Strichen. 2 Medals. 1900.
9. Turriff.—*Convener,* Alex Stuart, Laithers House, Turriff; *Secretary,* R. Cruickshank, Claymires, Turriff. 2 Medals. 1900.

Ayrshire.

10. Dalrymple.—*Convener,* ; *Secretary,* John Murchie, Netherton, Dalrymple. 2 Medals. 1899.
11. Fenwick.—*Convener,* James Dunlop of Gree, Fenwick; *Secretary,* James Dunlop, Midland, Fenwick. 2 Medals. 1899.
12. Kilmaurs.—*Convener and Secretary,* James D. Brown, Woodhill, Kilmaurs. 2 Medals. 1899.
13. Monkton, Newton, Prestwick, and St Quivox.—*Convener,* Thomas Howie, Fairfield Mains, Monkton; *Secretary,* John Meikle, Aitkenbrae Cottage, Monkton. 2 Medals. 1900.
14. Patna.—*Convener,* Robert Lees, Lagg, Ayr; *Secretary,* William Dunn, Hoodstone, Patna. 2 Medals. 1900.

Dumbartonshire.

15. Dumbartonshire.—*Convener,* Thomas M'Laren, Main Street, Alexandria; *Secretary,* William Davie, Main Street, Alexandria. 2 Medals. 1899.

Dumfries-shire.

16. Eskdale and Liddesdale.—*Convener,* John W. J. Paterson, Terrona, Langholm; *Secretaries,* Stevenson and Johnstone, Langholm. 2 Medals. 1899.
17. Sanquhar.—*Convener,* James Wightman, South Mains, Sanquhar; *Secretary,* William Murray, British Linen Co. Bank, Sanquhar. 2 Medals. 1900.

Elginshire.

18. Forres and Northern Fat Cattle Club.—*Convener,* Robert Urquhart, jun., Forres; *Secretary,* Alex. Dunbar, Solicitor, Forres. 2 Medals. 1899.

Fifeshire.

19. Ballingry and Auchterderran.—*Convener*, Hugh Stewart, Lumphinnans, Cowdenbeath; *Secretary*, Hugh Stewart, jun., Lumphinnans, Cowdenbeath. 2 Medals. 1899.
20. Cupar and North of Fife.—*Convener*, Sir John Gilmour of Montrave, Bart., Leven; *Secretary*, John Mitchell, Fliskmillan, Newburgh. 2 Medals. 1899.

Forfarshire.

21. Angus.—*Convener*, David Hume, Barrelwell, Brechin; *Secretary*, James Kydd, Arbroath. 2 Medals. 1899.

Renfrewshire.

22. Mearns.—*Convener*, Wm. Clark, Netherlee Farm, Cathcart; *Secretary*, James Pollock, Union Bank, Barrhead. 2 Medals. 1899.

Roxburghshire.

23. Liddesdale.—*Convener*, ; *Secretary*, Alex. Thomson, The Bank, Newcastleton. 2 Medals. 1899.
24. West Teviotdale.—*Convener*, John C. Scott of Synton, Hawick; *Secretary*, James Oliver of Thornwood, Hawick. 2 Medals. 1900.

Wigtownshire.

25. Galloway and Southern Counties.—*Convener*, James Drew, Doonhill, Newton-Stewart; *Secretary*, John Stroyan, 20 Victoria Street, Newton-Stewart. 2 Medals. 1900.

Applications from other Districts must be lodged with the Secretary of the Society *by 1st November next.*

RULES OF COMPETITION.

1. All Competitions must be at the instance of a local Society.
2. The classes for which Medals are granted must be in accordance with the list at page 47. The Committee shall select the classes, and specify them in the return.
3. A Committee of Management shall be appointed, and the Convener of the Committee must be a Member of the Highland and Agricultural Society.
4. The Money Premiums given in the District must be not less than £2 for each Medal claimed.
5. The Medal for Sheep-Shearing shall not be awarded unless there are three competitors, and it shall always accompany the highest Money Premium. There must not be fewer than two competitors in all the classes.
6. Blank reports will be furnished to all the Secretaries of the different Districts. These must, in all details, be completed and lodged with the Secretary of the Highland and Agricultural Society *on or before the 1st of November next*, with the exception of green crop reports, which must be forwarded on or before the 20th of December, for the approval of the Directors, against whose decisions there shall be no appeal.

7. When a grant has expired, the District shall not be eligible to apply again for aid for two years; and if no competition takes place in a District for two years, the grant shall expire.

PLOUGHING COMPETITIONS.

The Minor Silver Medal will be given to the winner of the first Premium at Ploughing Competitions, provided a Report in the following terms is made to the Secretary, within one month of the Competition, by a Member of the Society:—

FORM OF REPORT.

I, of , Member of the Highland and Agricultural Society, hereby certify that I attended the Ploughing Match of the Association at in the county of on the when ploughs competed; of land were assigned to each, and hours were allowed for the execution of the work. The sum of £ was awarded in the following proportions, viz.:—

[*Here enumerate the names and designations of successful Competitors.*]

RULES OF COMPETITION.

1. All Matches must be at the instance of a local Society or Ploughing Association, and no Match at the instance of an individual, or confined to the tenants of one estate, will be recognised.
2. The title of such Society or Association, together with the name and address of its Secretary, must be registered with the Secretary of the Highland and Agricultural Society, 3 George IV. Bridge, Edinburgh.
3. Not more than one Match in the same season can take place within the bounds of the same Society or Association.
4. All reports must be lodged within one month of the date of the Match, and certified by a Member of the Highland and Agricultural Society who was present at it.
5. A Member can only report one Match; and a Ploughman cannot carry more than three Medals in the same season.
6. To warrant the grant of the Medal there must have been twelve ploughs in Competition, and not less than Three Pounds awarded in Prizes by the local Society. The Medal to be given to the winner of the first prize.
7. Ploughmen shall not be allowed any assistance, and their work must not be set up nor touched by others; and attention should be given to the firmness and sufficiency of the work below more than to its neatness above the surface.
8. The Local Committee is required to fix the time to be allowed for ploughing the portion of land, and they are recommended that the time be at the rate of not more than ten hours per imperial acre on light land, and fourteen hours on heavy or stony land.

CLASS III.

COTTAGES AND GARDENS.

The following Premiums are offered for Competition in the Parishes after mentioned.

The Premiums are granted for two years.

PREMIUMS FOR BEST KEPT COTTAGES AND GARDENS.

1.	Best kept Cottage	£1 0 0
	Second best	0 10 0
2.	Best kept Cottage Garden	1 0 0
	Second best	0 10 0

RULES OF COMPETITION.

1. Competitions may take place in the different parishes for Cottages and Gardens, or for either separately.

2. The occupiers of Lodges at Gentlemen's Approach Gates and Gardeners' Houses are excluded, as well as others whom the Committee consider, from their position, not to be entitled to compete. The inspection must be completed by the 1st of October. In making the inspection, the Conveners may take the assistance of any competent judges.

3. It is left to the Committee of the District to regulate the maximum annual rent of the Cottages, which may, with the garden, be from £5 to £7.

4. To warrant the award of full Premiums, there must not be fewer than three competitors in each class. If there are less than three competitors in each class, only half Premium will be awarded.

5. A person who has gained the highest Premium cannot compete again.

6. If the Cottage is occupied by the proprietor, the roof must be in good repair; if the roof is thatch, it must be in good repair, though in the occupation of a tenant. The interior and external conveniences must be clean and orderly; the windows must be free of broken glass, clean, and affording the means of ventilation. Dunghills, and all other nuisances, must be removed from the front and gables. In awarding the Cottage Premiums, preference will be given to Competitors who, in addition to the above requisites, have displayed the greatest taste in ornamenting the exterior of their houses, and the ground in front and at the gables.

7. In estimating the claims for the Garden Premiums, the judges should have in view—the sufficiency and neatness of the fences and walks; the cleanness of the ground; the quality and choice of the crops; and the general productiveness of the garden.

8. Reports, stating the number of Competitors, the names of successful parties, and the nature of the exertions which have been made by them, must be transmitted by the Conveners to the Secretary *on or before the* 1*st November next.*

9. When a grant has expired, the District cannot apply again for aid for two years.

Parishes desirous of these Premiums must lodge applications with the Secretary *on or before the* 1*st November next.*

MEDALS FOR COTTAGES AND GARDENS OR GARDEN PRODUCE AND BEE-KEEPING.

The Society will issue annually two Minor Silver Medals to a limited number of local Associations or individuals, who at their own expense establish Premiums for Cottages and Gardens under £15 of Rent. One of the Medals may be awarded for the best kept Cottage, and the other for the best kept Garden or Flower-Plot, or Garden Produce, the produce of the cottager's own garden. Two Minor Silver Medals will also be issued to Local Bee-Keeping Associations.

Local Associations or individuals desirous of these Medals, must lodge applications with the Secretary *on or before the 1st November next.*

The Medals are granted for two years.

Aberdeenshire.

1. DAVIOT.—*Convener*, James Durno, Eastertown, Old Meldrum; *Secretary*, J. R. Campbell, Daviot, Old Meldrum. 2 Medals. 1899.
2. KINELLAR.—*Convener*, George Bruce, Tochineal, Cullen; *Secretary*, Neil Smith, Blackburn, Kinaldie. 2 Medals. 1898. (1 Medal awarded in 1899; 1 Medal for 1900.)
3. TYRIE.—*Convener*, James Cruickshank, Ladysford, Fraserburgh; *Secretary*, James Merson, Cairnmourning, Boyndlie, Fraserburgh. 2 Medals. 1899.

Argyllshire.

4. MULL AND MORVERN.—*Convener*, Mrs Fletcher of Glenaros, Isle of Mull; *Secretary*, Donald Macrae, The Villa, Salen, Aros, Mull. 2 Medals. 1899.

Ayrshire.

5. DARVEL. — *Convener*, Alex. Steel, Burnhead, Darvel; *Secretary*, Matthew Mair, Auchenbart, Darvel. 2 Medals. 1899.

Berwickshire.

6. LAUDERDALE BEE-KEEPERS.—*Convener*, George L. Broomfield, Lauder; *Secretary*, Robert Robson, Lauder. 2 Medals. 1900.

Fifeshire.

7. DYSART.—*Convener*, Alex. Hutchison, Ingleside, Kirkcaldy; *Secretary*, William R. Gibson, 54 St Clair Street, Kirkcaldy. 2 Medals. 1900.
8. FREUCHIE AND DISTRICT.—*Convener*, Walter Ness, Freuchie; *Secretary*, William Allan, Freuchie. 2 Medals. 1899.

Kirkcudbrightshire.

9. KIRKPATRICK-DURHAM.—*Convener*, James Cunningham, Tarbreoch, Dalbeattie; *Secretary*, D. C. G. Johnston, Kirkpatrick-Durham, Dalbeattie. 2 Medals. 1900.

Perthshire.

10. AUCHTERARDER.—*Convener*, ; *Secretary*, James Bonthrone, Auchterarder. 2 Medals. 1900.
11. BRACO.—*Convener*, ; *Secretary*, Wm. M'Ildowie, Crofthead, Braco. 2 Medals. 1899.
12. DUNNING.—*Convener*, Robert Gardiner, Henhill, Forteviot; *Secretary*, J. S. Wright, draper, Dunning. 2 Medals. 1900.
13. MENZIES FLOWER SHOW.—*Convener*, Sir Robert Menzies of Menzies, Bart.; *Secretary*, Miss Menzies of Menzies, Camserney Cottage, Aberfeldy. 2 Medals. 1900.

Renfrewshire.

14. SIR JOHN STIRLING MAXWELL GARDENS, &c. — *Convener*, Nicol Cameron, Dovehill, Pollokshaws; *Secretary*, Samuel Johnston, 69 Harriet Street, Pollokshaws. 2 Medals. 1899.

Ross-shire.

15. LOCHBROOM.—*Convener*, Murdo Macleay, Broom Cottage, Ullapool; *Secretary*, Hay Mackenzie, bank-agent, Ullapool. 2 Medals. 1900.

Stirlingshire.

16. KILLEARN.—*Convener*, David Wilson of Carbeth; *Secretary*, James Thomson, Post Office, Killearn. 2 Medals. 1899. (In abeyance in 1899.)
17. MILTON. — *Convener*, C. M. King, Antermony House, Milton of Campsie; *Secretary*, John Whitecross, Milton of Campsie. 2 Medals. 1900.
18. POLMONT.—*Convener*, David Mitchell, Millfield, Polmont; *Secretary*, James Boyd, Garthall, Falkirk. 2 Medals. 1900.

REGULATIONS.

1. Competitions may take place in the different districts for Cottages and Gardens, or for either separately. The one Medal may be offered for Cottages, and the other for Gardens or Garden Produce, but the two cannot be given in one class.

2. The annual value of each Cottage, with the ground occupied in the parish by a Competitor, must not exceed £15. The occupiers of Lodges at Gentlemen's Approach Gates, and Gardeners in the employment of others, are not entitled to compete.

3. If Competition takes place for Garden Produce in place of the best kept Garden, such produce must be *bona fide* grown in the Exhibitor's Garden, and he will not be allowed to make up a collection from any other Garden.

4. To warrant the award of a Medal, there must not be fewer than three Competitors.

5. Blank reports will be furnished to the Secretaries of the different Districts. These must, in all details, be completed and lodged with the Secretary of the Highland and Agricultural Society *on or before the 1st November next*, for the approval of the Directors, against whose decisions there shall be no appeal.

6. When a grant has expired, the District cannot apply again for aid for two years, and if no competition takes place in a District for two years the grant expires.

FIRST EDITION.]

Address for Telegrams—"SOCIETY," EDINBURGH.

Subject to Orders issued by the Board of Agriculture

HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND

GENERAL SHOW OF STOCK AND IMPLEMENTS

IN

KING'S PARK,

STIRLING,

ON 17TH, 18TH, 19TH, AND 20TH JULY 1900.

LAST DAYS OF ENTRY.

IMPLEMENTS AND OTHER ARTICLES—Monday, 14th May.

STOCK, POULTRY, AND DAIRY PRODUCE—Monday, 11th June.

No Entry at ordinary fees taken later than those which are received at the Society's Office, Edinburgh, by first post, or 10 o'clock, on Monday morning (11th June). Post Entries for Cattle, Horses, Sheep, and Swine taken on payment of 10s. additional for each entry (Poultry at double fees) till Wednesday morning (13th June), at the Society's Office, Edinburgh, at 10 o'clock.

COVERED BOOTHS FOR OFFICES—Monday, 11th June.

President of the Society.

RIGHT HON. LORD BALFOUR OF BURLEIGH.

Chairman of the Board of Directors.

A. M. GORDON OF NEWTON.

Convener of the Local Committee.

DAVID WILSON OF CARBETH.

The District connected with the Show comprises the Counties of Stirling, Dumbarton, and Clackmannan, and the Western Division of Perthshire.

REGULATIONS.

GENERAL CONDITIONS.

1. The Competition, except where otherwise stated, is open to Exhibitors from all parts of the United Kingdom.

2. Every Lot must be intimated by a Certificate of Entry, lodged with the Secretary *not later than Monday, 14th May, for Implements and other* *Ent*

Articles, and Monday, 11*th June, for Stock, Poultry, and Dairy Produce.* No Entry taken at ordinary fees later than those which are received at the Society's Office by first post, or 10 o'clock, on Monday morning, 11th June. Post Entries for Cattle, Horses, Sheep, and Swine taken on payment of 10s. additional for each entry (Poultry at double fees) till Wednesday morning (13th June), at the Society's Office, Edinburgh, at 10 o'clock. Printed forms of Entry will be issued on application to the Secretary, No. 3 George IV. Bridge, Edinburgh. Admission Orders will be forwarded to Exhibitors, by post, previous to the Show.

Protests. 3. Protests against the awards of the Judges, or against a violation of the judging regulations, must be lodged with the Secretary, at his Office in the Showyard, not later than 9 A.M. on Wednesday, the second day of the Show, and parties must be in attendance at the Secretary's Office, in the Showyard, at 9.30 A.M. that day, when protests will be disposed of. All protests must be accompanied by a deposit of £2, 2s., and if not sustained the sum may be forfeited at the discretion of the Directors.

4. Protests lodged for causes which the protester produces no good evidence to substantiate will render him liable to be reported to the Board of Directors, with the view, if they see reason, of his being prohibited from again entering Stock for a General Show.

Society not liable. 5. The Society shall not be liable for any loss or damage which Stock, Poultry, Dairy Produce, Implements, or other articles may sustain at the Show, or in transit.

Rejecting Entries. 6. The Society reserves the right to reject or cancel any entry or prohibit the exhibition of any entry.

Decisions of Board. 7. The decisions of the Board of Directors are final in all questions respecting Premiums and all other matters connected with the Show, and it shall not be competent for any Exhibitor to appeal against such decisions to, nor seek redress in respect of them from, any other tribunal.

Covered Booths. 8. Covered Booths for Offices (9 feet by 9 feet), purely for business, not for exhibition of goods, can be had for £3, 10s. to Members and £5 to Non-Members. Intimation to be made to the Secretary on or before the 29th of May. Those applying after that date to pay double Entry Money, but no application can be received later than 16th June.

Lights and Smoking. 9. No lights allowed in the Yard at night, and Smoking is strictly prohibited within the Sheds. Those infringing this Rule shall be liable to a fine of 10s.

Water. 10. As the command of water in the Yard is limited, it is particularly requested that waste be avoided.

Subjection to Rules. 11. All persons admitted into the Showyard shall be subject to the Rules and Orders of the Directors.

Powers of Stewards. 12. The Stewards have power to enforce the Regulations of the Society in their different departments, and to bring to the notice of the Directors and Secretary any infringement thereof.

Attendants. 13. All persons in charge of Stock or other Exhibits shall be subject to the orders of the Secretary and Stewards.

Violation of Rules. 14. The violation by an Exhibitor of any one of the Regulations shall render him liable to the forfeiture of all Premiums awarded to him, or of such a portion as the Directors may ordain, and also liable to be disqualified from again, or for a certain number of years, exhibiting at the Shows of the Society; or to have his case otherwise disposed of as the Directors may determine.

Railway Passes. 15. Railway Certificates for Stock and Implements are issued to Exhibitors before the Show along with their Tickets of Admission.

Removal of Exhibits. 16. No animal or article can be withdrawn before the formal closing of the Show at 5 P.M. on Friday; Steam Engines not till 6 o'clock. Stock and Implements may remain in the Yard till Saturday afternoon.

Payment of Prizes. 17. The Premiums awarded, except those withheld till birth of calf or

foal is certified, will be paid as soon after the Show as practicable, and, with the exception of the Tweeddale Gold Medal, Special Cups, and Medals, may be taken either in money or in plate.

STOCK AND POULTRY.

18. Poultry and Stock will be admitted on Monday, the day before the opening of the Show, and, with the exception of Horses, must be in the Yard before 12 o'clock that night. Horses must be in before 8 o'clock on the morning of Tuesday, except those entered for Jumping only, regarding which special Regulations will be found beside the list of prizes for Jumping. Judging begins at 10 A.M. on Tuesday. Exhibited on Tuesday, Wednesday, Thursday, and Friday. Stock may be admitted on the Saturday preceding the Show, but only by sending two days' prior notice to the Secretary. *Admission of Stock.*

19. An animal which has gained a first Premium at a General Show of the Society cannot again compete in the same class, notwithstanding any alteration in the heights stated for such class, but may be exhibited as Extra Stock. *Former Winners.*

20. All animals, except calves, foals, and lambs shown with their dams, must be entered in the classes applicable to their ages, and cannot be withdrawn after entry, or other animals be substituted in their place. *No substitution of animals.*

21. For prizes given by the Society, no animal shall be allowed to compete in more than one class; but this Rule does not apply to the Jumping and Driving Competitions. *One class only.*

22. Shorthorn, Aberdeen-Angus, Galloway, and West Highland animals must be entered in the herd-books, or the Exhibitor must produce evidence that his animal is eligible to be entered therein. *Herd-books.*

23. Stock must be *bona fide the property of* the Exhibitor on the last day of Entry. *Ownership.*

24. The Schedule of Entry must be filled up so far as within the knowledge of the Exhibitor. The Society shall have power at any time to call upon an Exhibitor to furnish proof of the correctness of any statement in his entry.

25. The name of the Breeder, if known, must be given, and if the Breeder is not known, a declaration to that effect, signed by the Exhibitor, must be made on the Entry Schedule, and no pedigree will be entered in the Catalogue when the Breeder is unknown. *Particulars of entries.*

26. Should it be proved to the satisfaction of the Directors that an animal has been entered under a false name, pedigree, or description, for the purpose of misleading the Directors or Judges as to its qualification or properties, or that information required in the Schedule and known or easily ascertained by the Exhibitor has been withheld, such animal may be disqualified either before or after a prize has been awarded to it, and the case may be reported to the Directors, in order that the Exhibitor may be disqualified from again competing at the Society's Shows, or his case otherwise disposed of as the Directors may determine. *Entries disqualified.*

27. When an animal has previously been disqualified by the decision of any Agricultural Association in the United Kingdom, such disqualification shall attach, if the Exhibitor, being aware of the disqualification, fail to state it, and the grounds thereof, in his entry, to enable the Directors to judge of its validity. Any person who is disqualified from exhibiting at any Show in the United Kingdom shall be prohibited from exhibiting at any General Show of the Society, unless with the special consent of the Board.

28. All Horses or Ponies entered in classes in which a particular height is stated shall before being judged be measured with their shoes on. No subsequent measuring or alteration of shoes will be permitted. *Height of Horses.*

Overfeeding. 29. Breeding Stock must not be shown in an improper state of fatness, and the Judges are requested not to award Premiums to overfed animals; and no Cattle or Sheep which have been exhibited as Fat Stock at any Show are eligible to compete in the Breeding Classes for the Society's Prizes.

Parades. 30. Horses and Cattle must be paraded at the times stated in the Programme of the Show, and when required by the Stewards, and under their direction. In Parade, Horses must be ridden or led as provided in their respective classes. Prize and commended animals will receive two rosettes each, which must be attached to the head of the animal, one on each side. Attendants must be beside their animals *twenty minutes before the hour of Parade*, and be ready to proceed to the ring immediately on receiving the order of the Stewards. Infringement of this Rule, or failure of any attendant to obey the orders of the Society's officials, will render the Exhibitor liable to a fine of 20s. for each separate infringement or act of disobedience, and to the forfeiture of any or all of the Prizes awarded to him at this Show.

Responsibility of Exhibitors. 31. Exhibitors shall be answerable for all acts, whether committed by themselves, their servants, or others in charge of their Stock, and shall be responsible for the condition of their animals during the whole time they remain in the Showyard.

Moving from stalls. *Washing Cattle.* 32. No animal shall be taken out of its stall after 10 A.M. during the Show except by order of the Stewards, or with permission of the Secretary. Cattle shall not be taken out of their stalls to be washed after the Judging has been finished. Those infringing this Rule shall be liable to a fine of 10s.

Sires. 33. Aged Bulls and Stallions must have had produce, and, along with two-year-old Bulls, three-year-old Colts, and two-shear and aged Tups, have served within the year of the Show.

Cows. 34. All Cows must have had calves previous to the Show. When exhibited, Highland Cows must be in milk or have calf at foot, and have had a calf within 9 months of the Show. Cows of other breeds, when exhibited, must either be in milk or in calf: if in milk, birth must have been within 9 months of the Show; if in calf, birth must be certified within 9 months after the Show.

35. Ayrshire Heifers in calf must produce a calf within nine months after the Show.

In-calf Heifers. 36. Two-year-old Heifers of the Shorthorn, Aberdeen-Angus, and Galloway breeds, and three-year-old Highland Heifers, must be in calf when exhibited, and the Premiums will be withheld till birth be certified, which must be within 9 months after the Show.

37. Animals of any age that have had a calf must be shown as Cows.

Mares. 38. A Mare entered in a class for "Mares with foal at foot" must have produced a foal after 1st January of the year of the Show, must have regularly nursed her own or another foal, and must have the foal with her in the Show. If the mare's own foal is alive it must be the foal shown with the mare. In the case of a Mare that has not foaled before the Show, or whose foal has died, she shall, if not in milk, be eligible without further entry to compete among the Yeld Mares. Agricultural Yeld Mares must produce a foal within 12 months from the first day of the Show. A Mare in a class for "Mares or Geldings" may or may not have had a foal in the year of the Show, but shall not have her foal exhibited with her, nor be in milk at the time of the show.

Calves and Foals. 39. With reference to Regulations 34, 35, and 36, birth of at least a seven months' calf must be certified; and in regard to Regulation 38, birth of at least a nine months' foal; or in the case of death, a Veterinary Surgeon's certificate must be produced certifying that at the time of death the animal was so far advanced with calf or foal that if it had lived it would have produced a calf or foal, as required by Rules 34, 35, 36, 38, and 39.

Ayrshire Cows. 40. All Milk Cows of the Ayrshire breed must be in the Yard on the evening of Monday, the day before the opening of the Show, before 8 o'clock, and they will be inspected by the Veterinary Surgeon, or other official of the Society, between 7 and 9 o'clock, to see if they have been milked dry; and if not, they must be milked under his direction. After the judging, all Milk Cows must be milked morning and evening.

Tampering with animals. 41. Any artificial contrivance or device of any description found on or proved to have been used on an animal, either for preventing the flow of milk or for any other improper purpose, will disqualify that animal from being awarded a Premium, and the Owner of said animal shall be prohibited from again entering Stock for any of the Society's General Shows, for such a period as the Directors may see fit.

Concealing animals. 42. No rug shall be hung up so as to conceal any animal in a horse-box or stall, except with special permission of the Steward of that department.

Hunters. 43. In the classes for Hunters four years old and upwards the Judges are empowered to transfer to the proper classes horses which, in regard to weight-carrying, are in their opinion entered in the wrong classes.

Soundness of Horses. 44. Judges are particularly requested to satisfy themselves, as far as possible, regarding the soundness of all Horses before awarding the Prizes, and to avoid giving Prizes to animals showing symptoms of hereditary diseases. The Judges may consult the Society's Veterinary Surgeon if they deem it expedient. No protests on veterinary grounds will be received.

Ewes. 45. All Ewes must have reared lambs in the year of the Show; and Ewes of the Blackfaced and Cheviot breeds must be in milk, and have their lambs at foot.

Clipping. 46. Sheep must have been clipt bare after 1st January of the year of the Show, and the Judges are instructed to examine the fleeces of the Sheep selected for Prizes, and to cast those on which they find any of the former fleece. This Rule does not apply to Cheviot sheep.

Sows. 47. Sows must have reared pigs in the year of the Show or be in pig; and Pigs must belong to the same litter, and be uncut.

Poultry. 48. In Poultry the Aged Birds must have been hatched previous to, and Cockerels and Pullets in, the year of the Show.

Securing Cattle. 49. Bulls must be secured by nose-rings, with chains or ropes attached, or with strong halters and double ropes. All Cattle, other than Highland Cattle, must be tied in their stalls.

Feeding appliances. 50. Servants in charge of Stock must bring their own buckets or pails, and a piece of rope or sheep-net to carry their forage. Mangers, sheep and pig troughs, will be provided.

Accommodation for animals. 51. Loose-boxes will be provided for Stallions, three, two, and one year-old entire Colts; for one-year-old Fillies, and for Mares with foals at foot; closed-in stables for all the other Horses, and covered accommodation for the whole of the other Live Stock. Stalls (floored) for attendants on Cattle, Horses, and Sheep will be provided at same rates as those charged for Stock.

Fodder. 52. Five days' supply of straw, hay, grass, and tares will be provided free by the Society. Any additional fodder or other kinds of food required will be supplied at fixed prices in the Forage-yard. Any servant removing bedding from an adjoining stall will be fined in double the amount taken. Exhibitors may fetch their own cake or corn to the Yard, but not grass, tares, hay, or straw. Coops, food, and attendance for Poultry will be provided by the Society.

Removal. 53. Cattle, Sheep, Swine, or Poultry cannot be removed from the Yard till 5 P.M. on Friday, the last day of the Show, except on certificate by the Veterinary Surgeon employed by the Directors, countersigned by the Steward of the department and the Secretary.

Withdrawal of horses over night. 54. Horses may be withdrawn at the close of the Show on Tuesday, Wednesday, and Thursday, on a deposit of £5 for each animal, which shall be forfeited, along with any prize money it may have gained, if the animal is not brought back. They must return between 7 and 7.30 the following morning, and those not in before 8 shall forfeit 10s. Horse passes to be applied for at the Secretary's Office between 5 and 6 P.M. on Tuesday, and the deposit, unless forfeited in whole or in part, will be returned between 12.30 and 2.30 on Friday.

Order in removal. 55. When the Stock is leaving the Yard, no animal is to be moved till ordered by those in charge of clearing the Yard. Those transgressing this Rule shall be liable to a fine of 10s., and detained till all the other Stock is removed.

JUDGING STOCK AND POULTRY.

Opening Gates. 56. On Tuesday, the first day of the Show, no person will be admitted, except Servants in charge of Stock, till 8 A.M., when the Gates are opened to the public.

Judging. 57. The Judges will commence their inspection at 10 A.M. The spaces reserved for the Judging will be enclosed, and no encroachment shall be permitted.

Insufficient merit. 58. In no case shall a Premium be awarded unless the Judges deem the animals to have sufficient merit; and where only one or two lots are presented in a section, and the Judges consider them unworthy of the Premiums offered, it shall be in their power to award a lower prize, or to suggest the removal of any lot which appears to them unworthy of a place in the Yard.

Commendations. 59. In addition to the Premiums, the Judges are authorised to award three Commendations in each section, if the entries are numerous and the animals of sufficient merit. These Commendations consist of—Very Highly Commended, Highly Commended, and Commended.

Ayrshire Cows and Heifers. 60. Ayrshire Cows which have not calved before the Show, whether entered in the class for Cows in Milk or for Cows in Calf, shall be judged along with the Cows in Calf, and Ayrshire Cows or Heifers which have calved before the Show—in whichever of the two classes entered—shall be judged along with Cows in Milk.

Attending Members. 61. One Member of Committee and one or two Directors shall attend each section of the Judges. It will be their duty to bring the animals out to the Judges and to see that no obstruction is offered to them, and that the space reserved for them is not encroached upon; to ticket the prize animals; to send the Nos. of prize animals to the Award Lectern near the Secretary's office; to assist the Judges in completing their return of awards; and should any difficulty arise, to communicate with the Stewards or Secretary.

62. It shall not be competent for any Exhibitor, nor for his Factor or Land-Steward, to act as a Judge or attending Member in any class in which he is competing.

DAIRY PRODUCE.

63. Dairy Produce will be received in the Showyard on Monday, the day before the opening of the Show, and till 8 A.M. on Tuesday, the first day of the Show. Judged at 10 A.M. on Tuesday. Exhibited Tuesday, Wednesday, Thursday, and Friday.

64. Dairy Produce must have been made on the Exhibitor's farm this year. No Exhibitor shall show more than one lot in each class. No lot can be removed from the Yard till 5 P.M. on Friday, the last day of the Show. The Society undertakes no responsibility for the receipt or despatch of exhibits, nor for the loss of exhibits, nor for any injury they may sustain during the Show.

STALL RENT (INCLUDING ENTRY FEE).

65. The following rates (which include Entry Fees and Stall Rent) shall be paid by Exhibitors when making their Entries:—

	Members.		Non-Members.	
	s.	d.	s.	d.
Stalls for Cattle, each	15	0	25	0
Boxes for Stallions over 12 hands, for 3 and 2 year-old Colts, and for Mares, over 12 hands, with Foal at foot	30	0	40	0
Boxes for one-year-old entire Colts, one-year-old Fillies, Stallions, 12 hands and under, and Mares, 12 hands and under, with Foal at foot	20	0	30	0
Boxes for Geldings over 12 hands, or Mares, over 12 hands, without Foal at foot	25	0	35	0
Stalls for Geldings over 12 hands, or Mares, over 12 hands, without Foal at foot	20	0	30	0
Stalls for Geldings, 12 hands and under, or Mares, 12 hands and under, without Foal at foot	15	0	20	0
Shed Accommodation for Machines for driving competitions, each	5	0	10	0
Sheep or Swine, per pen	10	0	15	0
Wool, per entry	2	6	5	0
Poultry, each entry	2	0	3	0
Dairy Produce, each entry	4	0	6	0
Covered Booths for offices, 9 feet by 9 feet	70	0	100	0
Newspaper offices . . £2, 10s.				

Entries in more than one Class.—In the case of animals entered in more than one class, the entry fee shall be five shillings for each class after the first. This does not apply to the Jumping Competitions.

EXTRA STALL FOR ATTENDANTS.

66. Exhibitors of Stock shall be entitled to take an extra Stall or Box for the accommodation of their attendants, but they must state when making their Entry that the Stall or Box is to be used for that purpose, and remit rent, which is at the same rate as stated above for the particular class of stock.

IMPLEMENTS AND OTHER ARTICLES.

67. Implements will be received in the Yard from Tuesday, 10th July, till 5 o'clock on the afternoon of Monday, 16th July. Exhibited Tuesday, Wednesday, Thursday, and Friday. The Schedule of Entry must be filled up so far as within the knowledge of the Exhibitor, and prices must be stated. *Admission.*

68. No Money Prizes or Medals, except when specially offered, will be given by the Society for Implements of any kind. *Premiums.*

69. Agricultural Implements, and Implements and collections of articles not Agricultural, will be received for Exhibition, but the Secretary is entitled to refuse Entries from dealers in articles not deemed worthy of Exhibition. *Refusing Entries.*

70. In order to encourage exhibits of Agricultural Implements from operative Blacksmiths and Carpenters in the district of the Show, open space will be provided for these in some less prominent part of the Yard at a charge of 10s. for space 10 feet wide and 20 feet deep. *Local Operatives.*

71. Implements will be entered in the following sections—viz., 1st, Under Cover, for Agricultural Implements; 2nd, Open, for Agricultural Implements; 3rd, Exhibits not Implements of Husbandry, either under cover or open, as may be deemed necessary by the Secretary; 4th, Motion Yard; 5th, Open space for Agricultural Implements from operative *Order of Implements.*

Blacksmiths and Carpenters in the district of the Show. Exhibitors must specify the space they require.

Articles not entered. 72. Every article to be exhibited must be entered on the Society's Entry Form. Any article not so entered that is taken to the Show is liable to be ordered out of, or removed from, the Showyard, or confiscated to the Society. Exhibitors infringing this rule are moreover liable to a fine of £1.

Selling by auction and noisy behaviour forbidden. 73. "Cheap-Jacks" are not admitted to the Showyard. The selling of goods by auction, shouting, and other behaviour calculated to annoy visitors or Exhibitors, are strictly forbidden. Exhibitors infringing this Regulation are liable to a fine of £1, and to have themselves and their goods ordered out of, or removed from, the Showyard, or to have their goods confiscated to the Society.

Placing Exhibits. Removing Exhibits. 74. The articles of each Exhibitor must be all placed in one stand, except Implements in motion, and must not on any account extend beyond the allotted space. No article shall be moved out of its stand, or the stand dismantled, till the termination of the Show, at 5 P.M. on Friday. Those infringing this Rule shall be liable to a fine of 10s.

Restoring Turf. 75. When the ground requires to be broken, the turf must be carefully lifted and laid aside, and the surface must be restored to the satisfaction of the Society, and at the expense of the Exhibitor.

Arranging Exhibits. 76. Exhibitors must arrange their own articles *within* the space allotted to them before 9 o'clock on Tuesday, and to the satisfaction of the Stewards in charge of the Implement Yard.

Handbills. 77. Exhibitors are not allowed to distribute handbills anywhere in the Yard except at their own Stand; and they must not for this or any other purpose encroach upon the adjacent alleys or open spaces.

Sweeping Stands, &c. 78. Exhibitors are required to have their Stands and the portions of the alleys immediately adjoining them swept up before eight o'clock on each morning of the Show.

Fuel. 79. All Machines requiring steam or fire must be entered as such in the Certificate, and will be placed in the Motion Yard. *Coke only shall be used in all cases where fire is required after* 10 *o'clock* A.M. Those infringing this Rule shall incur a penalty of £5.

Steam Engines. 80. No Steam Engine shall be driven in the Yard at a greater speed than 4 miles an hour. Traction Engines shall not be used in conveying Exhibits or other goods into, from one place to another in, or out of the Showyard.

81. Locomotive and Traction Engines and other Machines must not be moved from their places without permission of the Secretary or Stewards, and must not leave their stands till 6 P.M. on Friday.

Consigning Implements. 82. There must be attached to each Implement, when forwarded to the Show, a label bearing the Exhibitor's name, and that of the Implement, as well as the number of the Exhibitor's stand.

83. The carriage of all Implements must be prepaid.

Exhibitors' and Attendants' Tickets. 84. Each Exhibitor in the Implement Department will receive one free Ticket of Admission to the Showyard for himself or a member of his firm, and will receive, in addition, for the use of attendants employed by him at his Stand, two Tickets of Admission for each complete ten feet of shedding in the Motion Yard, and one Ticket for each complete ten feet of shedding in the other sections. No additional Free Tickets can be issued in any circumstances whatever. Additional Attendants' Tickets, not more than five for any one Exhibitor, may be purchased at 5s. each.

Tickets to be filled up and signed. 85. The Tickets of Admission for Exhibitors and Attendants referred to in the foregoing Regulation will (about fourteen days prior to the Show) be issued to the Exhibitors in blank, with the number of the Exhibitor's Stand. The name of the person for whom each ticket is intended must be written on it before it is used. Each person holding a Free Ticket of Admission must sign his or her name on the back thereof, and must also,

when required, sign his or her name in the book at the Entrance Gate. Exhibitors' attendants are strictly cautioned not to lend or transfer their Tickets, which can be used only by the persons whose names they bear, and who must be *bona fide* acting for, or employed by, the Exhibitor. No Ticket is transferable. An Exhibitor is liable to a fine of £1 for each case of transfer or other improper use of a Ticket issued to himself or employee. *Tickets not Transferable.* *Improper use of Tickets.*

STALL RENT.

86. Ground to be taken in spaces of 10 feet frontage by 20 feet deep, except in Motion Yard, which is to be 10 feet or any larger amount of frontage by 50 feet deep.

87. Rates for space, payable by Exhibitors when making their Entries:—

	Members	Non-Members.
Shedding, 20 feet deep, 7 feet high, per 10 feet .	£1 5 0	£1 15 0
Space without Shedding, 20 feet deep, per 10 feet .	1 5 0	1 15 0
Space in Motion Yard, without Shedding, 50 feet deep, per foot	0 5 0	0 8 0
And with Shedding, 20 feet deep, 10 feet high, per foot	0 7 0	0 10 0
Covered Booths for offices, 9 feet by 9 feet, each .	3 10 0	5 0 0
Newspaper offices, each . . £2, 10s.		

ADMISSION OF THE PUBLIC.

The public will be admitted daily at 8 A.M. Judging begins on Tuesday at 10 A.M. The charges for admission to the Yard will be—Tuesday, from 8 A.M. till 5 P.M., 5s. Wednesday, from 8 A.M. till 5 P.M., 3s. Thursday, from 8 A.M. till 5 P.M., 2s. Friday, from 8 A.M. till 5 P.M., 1s.

ADMISSION OF MEMBERS AND EXHIBITORS.

On exhibiting their "*Member's Ticket,*" which is strictly not transferable, Members of the Society are admitted free to the Showyard and to the Enclosures and Stands around the Large Ring, excepting the Reserved Seats in the Grand Stand, and such other parts as may be reserved for any special purpose. Tickets will be sent to all Members residing in the United Kingdom whose addresses are known, and on no account will duplicates be issued. All Members not producing their tickets must pay at the gates, and the admission money will not on any account be returned.

Tickets of admission to the Showyard are sent to Exhibitors of Stock, Poultry, and Dairy Produce (not Members) whose Entry Fees amount to not less than 10s.

For Exhibitors of Implements and their assistants tickets are issued as provided in the Regulations for Implements.

Tickets for attendants on Stock are not available to admit to the Yard between 11 A.M. and 5 P.M.; and any of these attendants requiring to leave the Yard during the day cannot be again admitted except by a special pass (to be applied for at the Ticket Gate), which must be given up on his return.

RESERVED SEATS IN GRAND STAND.

Reserved Seats in the Grand Stand (numbered).

For Charges, apply to Secretary.

VARIOUS.

Placards, except those of the Society, are prohibited both inside the Showyard and on the outside of the Boundary Fence, with the exception of those belonging to Exhibitors, whose right is confined to their own stalls. No newspapers or any other article allowed to be carried about the Yard for sale or display. No strolling bands or musicians admitted.

No Carriages or Equestrians admitted without special leave from the Directors, and then only for Invalids. Bath-chairs may be brought in.

Premium Lists, Regulations, and Certificates of Entry may be obtained by applying at the Secretary's Office, No. 3 George IV. Bridge, Edinburgh.

All Communications should be addressed to JAMES MACDONALD, Esq., *Secretary of the Highland and Agricultural Society of Scotland, No. 3 George IV. Bridge, Edinburgh.*

Address for Telegrams—"SOCIETY," EDINBURGH.

LAST DAYS OF ENTRY.

IMPLEMENTS AND OTHER ARTICLES—Monday, 14th May.

STOCK, POULTRY, AND DAIRY PRODUCE—Monday, 11th June.

No Entry at ordinary fees taken later than those which are received at the Society's Office, Edinburgh, by first post, or 10 o'clock, on Monday morning (11th June). Post Entries for Cattle, Horses, Sheep, and Swine taken on payment of 10s. additional for each entry (Poultry at double fees) till Wednesday morning (13th June), at the Society's Office, Edinburgh, at 10 o'clock.

COVERED BOOTHS FOR OFFICES—Monday, 11th June.

RAILWAY ARRANGEMENTS.

The Railway Companies will be furnished with a list of the Exhibitors of Stock and Implements, after the 30th June, and all applications for horse-boxes and trucks, and for information as to arrangements of Special Trains, must be made by the Exhibitors themselves with the Stationmaster where their stock is to be trucked.

The arrangements made by the Railway Companies for the conveyance of Live Stock and Goods to and from the Show are **indicated** *below, but exhibitors are recommended to apply to the respective companies for* **full particulars** :—

1. Live Stock and Goods *to* the Show to be charged ordinary rates.
2. Live Stock and Goods *from* the Show, *if sold*, to be charged ordinary rates.
3. Live Stock and Goods *from* the Show, *if unsold*, to be carried at half rates back to the station whence they were sent, at owners' risk, on production of a certificate from the Exhibitor to the effect that they are really unsold; failing production of such certificate, ordinary rates must be charged. The reduction to half rate is to be allowed only when the animals or goods are returned by the same route as that by which they were conveyed *to* the Show. The minimum charge for Stock returned at half rates will be one-half the ordinary minimum.

If the unsold Live Stock which was carried on the outward journey by Passenger Train in horse-boxes be required to be returned by Goods Train in cattle trucks, half the Goods Train rates must be charged.

If the unsold Live Stock which was carried on the outward journey by Goods Train in cattle trucks be required to be returned by Passenger Train in horse-boxes, half the Passenger Train rates must be charged.

4. Horses and Cattle, when sent for exhibition from one Agricultural Show to another, in another part of the country, are charged the ordinary single rates in respect of each journey, from point to point, up to the last station to which they are sent for exhibition. If remaining unsold when returned from the latest Show to the originating or home station, they are—on production of the necessary certificates—charged half rates, provided such return journey is made by the line of the company by whose route it was conveyed on the outward

journey, or, where more than one company is concerned, by the same route as conveyed on the outward journey. If conveyed by Goods Train, Unsold Live Stock transferred from one Agricultural Show to another in another part of the country must be charged ordinary rates.

5. Unsold goods, previously carried by railway, transferred from one Agricultural Show to another, in another part of the country, will be conveyed at half rates at owners' risk, on production of certificate from the Exhibitor to the effect that they are unsold; failing production of such certificate, ordinary rates will be charged.

6. Poultry to be charged ordinary rates both ways, and will not be accepted for conveyance unless the carriage charges are prepaid.

7. Horse-boxes, or other Passenger Train vehicle, will not be provided for the carriage of Live Stock sent by Goods Train and invoiced at Goods Train rates. *For rates for Horse-boxes by Passenger and Special Trains, apply to the Railway Companies.*

8. Provender conveyed to Agricultural Shows with Live Stock will be charged ordinary rates, except so much of the same as may be required on the journey.

9. Men, certified by the owners to be *bona fide* in charge of Live Stock, to be conveyed free in the same train as the animals, as follows: One man for each consignment, except when the consignment requires more than one vehicle, when one man for each vehicle may be sent free; but no pass is given unless the charge for the consignment amounts to as much as the charge for one horse. When two or three horses forming one consignment are sent in the same horse-box, and a man is required to travel with each animal, the men may be conveyed free, provided each horse is charged at the single horse rate. Upon both the outward and homeward journeys a separate certificate and contract must be given, which must be retained by the stationmaster at the outward or homeward starting point, as the case may be.

10. The ordinary rates charged for carriage do not in any case include delivery *to*, or collection *from*, the Show ground.

11. Agricultural Societies' Show Plant must be charged at Class C rates, station to station.

12. Tents, Canvas, and other articles carried to Shows, not for exhibition, to be charged the ordinary rates both going and returning.

13. The carriage of all Live Stock, Implements, and other articles going to the Show for exhibition must be *prepaid.*

DELIVERY CHARGES.

The following will be the Charges for the Delivery or Collection of Live Stock, Implements, and other articles between the Railway Stations at Stirling and the Show ground:—

1. General traffic, 2s. per ton (minimum charge, 1s. 6d.)
2. Implements and Machinery (Agricultural), not exceeding 1 ton each, 2s. 6d. per ton (minimum charge, 2s.)
3. Implements and Machinery (Agricultural), on their own wheels (specially hauled), not exceeding 1 ton, 3s. each.
4. Single articles, exceeding 1 ton, but not exceeding 3 tons, 3s. per ton.
5. Single articles, exceeding 3 tons, but not exceeding 5 tons, 6s. per ton.
6. Single articles, exceeding 5 tons, by special arrangement only, but no less charge than 8s. per ton.
7. Rustic Houses, by special arrangement only, but no less charge than 7s. 6d.
8. Carriages, four-wheeled, 3s. each.
9. Carriages, two-wheeled, 2s. each.
10. Cattle, in floats, 3s. 6d. per head (minimum charge, 5s.)
11. Sheep and Pigs, in floats, 1s. per head (minimum charge, 5s., and maximum charge, 7s. 6d. for each float).

THE PRESIDENT'S CHAMPION MEDALS

A Champion Medal is given by LORD BALFOUR OF BURLEIGH, President of the Society, for the *best Animal or pen* in each of the following sections:—

1. Shorthorn.
2. Aberdeen-Angus.
3. Galloway.
4. Highland.
5. Ayrshire.
6. Jersey.
7. Clydesdale Stallions.
8. Draught Geldings.
9. Clydesdale Mares and Fillies.
10. Hunters.
11. Hackneys.
12. Harness Horses.
13. Ponies.
14. Shetland Ponies.
15. Blackfaced Sheep.
16. Cheviot.
17. Border Leicester.
18. Shropshire.
19. Half-bred.
20. Oxford Down.
21. Suffolk.
22. Swine.

NOTE.—*Animals entered as Extra Stock may compete for these Medals. Former Winners of the President's Medals are eligible. The award of these Medals is not subject to the Rules as to calving and foaling. The Society shall have the right to photograph the Winners for publication in the 'Transactions.' At this Show no animal can be awarded more than one of these Medals.*

CATTLE

SHORTHORN.

Class		Premiums. 1st.	2nd.	3rd.	4th.
		£	£	£	£
1.	Bull calved before 1898 . .	15	10	5	3
2.	Bull calved in 1898 . . .	15	10	5	3
3.	Bull calved in 1899 . . .	12	8	4	2
	[1] Best Bull in the three Classes—£20. Breeder of best Bull of any age in the three Classes—The Silver Medal.				
4.	Cow of any age . . .	12	8	4	2
5.	Heifer calved in 1898 . . .	10	5	3	2
6.	Heifer calved in 1899 . . .	10	5	3	2
	[2] Best Female in the three Classes—£10, 10s.				
	President's Medal for best Shorthorn.				
	Carry forward				£158

ABERDEEN-ANGUS.

[3] Two Silver Cups, each of the value of £50, for the best Bull of any age and for the best Cow of any age (Heifers excluded) in the Aberdeen-Angus cattle classes. These are to be Challenge Cups, and are to be known as the "Ballindalloch Challenge Cups." They are offered under the following conditions: 1. The Directors shall assume charge of the Cups, and shall frame such rules for their safety as they may decide upon. 2. Each Cup shall be held by the winner for one year as a Challenge Cup, and shall become the property of the exhibitor who shall win it five times, not necessarily in succession. 3. The Society shall, at their own expense, cause to be engraved on each Cup each year, the year, the place of the Show, name of successful exhibitor, name and herd-book number of the animal, and name of its breeder. 4. The Society shall award to the breeder of the successful animals a

[1] Given by the Shorthorn Society.

[2] Given by Mr Alexander M. Gordon of Newton.

[3] The Cup for Bulls given by Sir George Macpherson Grant, Bart., and that for Cows by the late Mr C. Macpherson Grant of Drumduan.

Silver Medal, bearing that he is the breeder of the winner of the "Ballindalloch Challenge Cup." 5. In every other respect the Cups shall be won according to regulations which the Directors may from time to time enact.

	Premiums. 1st.	2nd.	3rd.	4th	
					Brought forward £158
Class	£	£	£	£	
7. Bull calved before 1st Dec. 1897 .	15	10	5	3	
8. Bull calved on or after 1st Dec. 1897 .	15	10	5	3	
9. Bull calved on or after 1st Dec. 1898 .	12	8	4	2	
[1] Champion Cup, value £50, for the best Bull in the three Classes.					
Breeder of best Bull of any age in the three Classes—The Silver Medal.					
10. Cow of any age . . .	12	8	4	2	
[2] Champion Cup, value £50, for the best Cow of any age in the above Class.					
11. Heifer calved on or after 1st Dec. 1897	10	5	3	2	
12. Heifer calved on or after 1st Dec. 1898	10	5	3	2	
[3] Champion Gold Medal for best animal of the breed in the Showyard.					158
President's Medal for best Aberdeen-Angus Animal.					

GALLOWAY.

13. Bull calved before 1st Dec. 1897 .	15	10	5	3	
14. Bull calved on or after 1st Dec. 1897 .	15	10	5	3	
15. Bull calved on or after 1st Dec. 1898 .	12	8	4	2	
Breeder of best Bull of any age in the three Classes—The Silver Medal.					
16. Cow of any age . . .	12	8	4	2	
17. Heifer calved on or after 1st Dec. 1897	10	5	3	2	
18. Heifer calved on or after 1st Dec. 1898	10	5	3	2	
President's Medal for best Galloway.					158

HIGHLAND.

19. Bull calved before 1898 . .	15	10	5	3	
20. Bull calved in 1898 . . .	15	10	5	3	
21. Bull calved in 1898 . . .	12	8	4	2	
Breeder of best Bull of any age in the three Classes—The Silver Medal.					
22. Cow of any age, in Milk, or with Calf at foot	12	8	4	2	
23. Heifer calved in 1897 . .	10	5	3	2	
24. Heifer calved in 1898 . .	10	5	3	2	
President's Medal for best Highland Animal.					158
					Carry forward £632

[1] Given by Sir George Macpherson Grant, Bart.
[2] Given by the late Mr C. Macpherson Grant of Drumduan.
[3] Given by the Polled Cattle Society.

Brought forward £632

Class	EXTRA STOCK.	Premiums. 1st. £	2nd. £	3rd. £	
25.	[1] Highland Bullock Stirk, calved after 1st January 1899—£8, £6, £4, and £2.				
	AYRSHIRE.				
26.	Bull calved before 1898 . .	12	8	4	
27.	Bull calved in 1898 . . .	12	8	4	
28.	Bull calved in 1899 . . .	8	5	3	
	Breeder of best Bull of any age in the three Classes—The Silver Medal.				
29.	Cow calved before 1897 in Milk .	10	7	3	
30.	Cow calved in 1897 in Milk . .	10	7	3	
31.	Cow of any age in Calf, or Heifer calved in 1897 in Calf and due to calve within nine months after the Show	10	7	3	
32.	Heifer calved in 1898 . .	10	5	3	
33.	Heifer calved in 1899 . .	8	5	3	
	President's Medal for best Ayrshire.				158
	[2] JERSEY.				
34.	Bull, any age. . . .	10	5	3	
35.	Cow, in Milk, calved before 1898 .	10	5	3	
36.	Cow in Milk, or Heifer in Calf, calved in 1898	10	5	3	
37.	Heifer calved in 1899 . .	8	4	2	
	President's Medal for best Jersey.				68
					£858

HORSES

FOR AGRICULTURAL PURPOSES.

CAWDOR CHALLENGE CUP, VALUE 50 GUINEAS, FOR BEST MARE.

Conditions of Competition.—This Cup is offered by the Clydesdale Horse Society of Great Britain and Ireland for the best Clydesdale Mare or Filly registered in the Clydesdale Stud-book, entered in any of the Draught Horse classes or as Extra Stock, former prize-winners being eligible to compete for the Cup. The Cup must be won three times by an exhibitor (but not necessarily in consecutive years or with the same animal) before it becomes his absolute property. The winner of the Cup, other than the absolute winner, shall, before delivery thereof is made to him, give security to the Clydesdale

[1] Given by Lord Malcolm and Mr T. V. Smith of Ardtornish.
[2] Rule 40 applies to Jersey Cows.

Horse Society that he shall surrender the same to the Society and deliver it at the Society's office when called upon to do so. Until the Cup be won outright, the winner of the Cup will receive the Clydesdale Horse Society's Silver Medal as a memento of his winning the Cup.

The Clydesdale Horse Society shall have the option of photographing the winner for publication in the Clydesdale Stud-book.

DRAUGHT STALLIONS.	Premiums. 1st.	2nd.	3rd.	4th.	
Class	£	£	£	£	
38. Stallion foaled before 1897 . .	20	15	10	4	
39. Entire Colt foaled in 1897 . .	20	15	10	4	
40. Entire Colt foaled in 1898 . .	20	12	8	4	
41. Entire Colt foaled in 1899 . .	15	10	6	4	
					£177

Breeder of best Male Animal of any age in the four Classes—The Silver Medal.

President's Medal for best Clydesdale Stallion.

DRAUGHT GELDINGS.

42. Draught Gelding foaled before 1897	10	5	3	—	
43. Draught Gelding foaled in 1897 .	6	4	3	—	
44. Draught Gelding foaled in 1898 .	6	4	3	—	
					44

President's Medal for best Draught Gelding.

DRAUGHT MARES AND FILLIES.

45. Mare of any age, with Foal at foot	20	12	7	4	
46. Yeld Mare foaled before 1897 .	12	9	6	4	
47. Yeld Mare or Filly foaled in 1897 .	12	9	6	4	
48. Filly foaled in 1898 . .	12	9	6	4	
49. Filly foaled in 1899 . .	12	9	6	4	
					167

Best Mare or Filly—Challenge Cup, value 50 guineas, as on page 68.

[1] Breeder of Best Clydesdale Brood Mare—The Robert Murdoch Prize, value £10.

President's Medal for best Clydesdale Mare or Filly.

HUNTERS.

50. Colt, Gelding, or Filly, foaled in 1899, the produce of thorough-bred Stallions, out of Mares of any breed, —Five Prizes [2]—£10, £7, £5, £2, £1.

Carry forward £388

[1] Bequest by the late Miss Murdoch.
[2] Given by Sir John Gilmour of Montrave, Bart.

No animal is allowed to compete in more than one Class, except that horses entered in other Classes may also compete in the Jumping and Driving Classes.

	1st. £	2nd. £	3rd. £	
Brought forward				£388
HUNTERS—*continued.*				
Class 51. Filly, Mare, or Gelding, for field, foaled in 1898—*in hand* .	8	5	3	
52. Yeld Mare, Filly, or Gelding for field, foaled in 1897—*in hand* .	8	5	3	
[1] Best Hunter Filly in Classes 50, 51, and 52—Gold Medal, value £10, 10s.				
53. Mare or Gelding, foaled before 1st January 1897, able to carry over 13 stone 7 lb.—*in saddle* .	20	10	5	
54. Mare or Gelding, foaled before 1st Jan. 1897, able to carry any weight up to 13 stone 7 lb.—*in saddle* .	15	8	4	
55. [2] Hunter Brood Mare, with foal at foot or to foal this season—£15, £8, £4.				94

President's Medal for best Hunter.

HACKNEYS.

(All to be shown in hand.)

	1st. £	2nd. £	3rd. £	
56. Brood Mare, 15 hands and upwards, with Foal at foot, or to foal this season to a registered Sire .	10	6	4	
57. Brood Mare, under 15 hands, with Foal at foot, or to foal this season to a registered Sire . .	10	6	4	
58. Yeld Mare or Filly, foaled in 1897 .	8	5	3	
59. Filly, foaled in 1898 . .	8	5	3	
60 Filly, foaled in 1899 . .	8	5	3	
61. Stallion, foaled in or before 1897, over 15 hands . . .	10	6	4	
62. Stallion, foaled in or before 1897, over 14 and not over 15 hands .	10	6	4	
63. Entire Colt, foaled in 1898 . .	8	5	3	
64. Entire Colt, foaled in 1899 . .	8	5	3	
				160

All animals entered in the above Hackney Classes must be registered in the Hackney Stud-book except in Classes 60 and 64, and animals entered in Classes 60 and 64 must be eligible for entry in the Hackney Stud-book.

Carry forward £642

[1] Given by the Hunter Improvement Society.
[2] Given by Captain Clayhills Henderson of Invergowrie, R.N.

Brought forward £642

[1] Gold Medal, value £10, by Hackney Horse Society for best Mare or Filly in Hackney or Pony Classes.

President's Medal for best Hackney in above Classes.

PONIES.	Premiums. 1st. £	2nd. £	3rd. £	
Class				
65. Stallion, 3 years old and upwards, over 12, not exceeding 14 hands —*in hand* . . .	5	3	2	
66. Yeld Mare, Filly, or Gelding, 3 years old and upwards, over 13 and not over $14\frac{1}{2}$ hands—*in saddle*	5	3	2	
67. Yeld Mare, Filly, or Gelding, 3 years old and upwards, over 12 and not over 13 hands—*in saddle*	5	3	2	
68. Stallion, 3 years old and upwards, 12 hands and under—*in hand* .	5	3	2	
69. Yeld Mare, Filly, or Gelding, 3 years old and upwards, 12 hands and under—*in saddle* . .	5	3	2	
President's Medal for best Pony.				50

SHETLAND PONIES.

(*All to be shown in hand.*)

70. Stallion, not exceeding $10\frac{1}{2}$ hands, foaled before 1897 . .	5	3	2	
71. Mare, not exceeding $10\frac{1}{2}$ hands, with foal at foot . . .	5	3	2	
72. Yeld Mare, Filly, or Gelding, not exceeding $10\frac{1}{2}$ hands, foaled before 1898 . . .	5	3	2	
73. Colt, Gelding, Mare, or Filly, foaled in 1898 or 1899, not exceeding $10\frac{1}{2}$ hands . . .	5	3	2	
				40

Carry forward £732

[1] A Mare 6 years old or more must have had a living foal. Winners of the Hackney Society's Gold Medals in 1900, except at the London and Royal English Shows, excluded. The winner must be entered or accepted for entry in Hackney Stud-book, and certified free from hereditary disease. The Gold Medal being of the intrinsic value of £10, that amount will be paid by the Hackney Horse Society at any time if the Medal be returned in good condition.

Brought forward . £732

SHETLAND PONIES—*continued*

[1] Silver Cup, value £10, 10s, for best Shetland Pony, Stallion, Mare, or Gelding, exhibited in saddle or harness. Animals competing may be drawn from the ordinary classes, but must be entered specially for this prize.

[2] Pieces of Plate, value £12, 12s, for prizes for Shetland Ponies, as follows:—

(*a*) Piece of Plate, value £4, 4s., for best piebald or skewbald Shetland Pony, Stallion, Mare, or Gelding, not exceeding 10½ hands, entered in the ordinary classes, but prize-winners in these classes excluded.

(*b*) Piece of Plate, value £4, 4s., for Shetland Pony, Stallion, Mare, or Gelding, not exceeding 10½ hands, with best head, neck, and shoulders, entered in the ordinary classes, but prize-winners in those classes excluded.

(*c*) Piece of Plate, value £4, 4s., for Shetland Pony, Stallion, Mare, or Gelding, not exceeding 10½ hands, with best legs and feet, entered in ordinary classes, but prize-winners in these classes excluded.

Exhibitors must state on the entry form which, if any, of these Special Prizes (*a*, *b*, or *c*) they wish to compete for. No pony can win more than one of these Special Prizes

President's Medal for best Shetland Pony.

DRIVING COMPETITIONS.	Premiums. 1st.	2nd	3rd.	
Class	£	£	£	
74 Yeld Mare, Filly, or Gelding, in Harness, 15 hands and upwards, to be driven in the ring . .	10	5	3	
75. Yeld Mare, Filly, or Gelding, in Harness, under 15 hands, to be driven in the ring .	10	5	3	
				36

President's Medal for best animal in the Classes for Horses in Harness [3]

£768

[1] Given by Mr R W R Mackenzie, Earlshall, Leuchars

[2] Given by various contributors, per Mrs Hope Johnstone

[3] *An animal that has won a President's Medal in another section in this Show shall not be eligible to compete for the Medal in this section.*

JUMPING COMPETITIONS

SPECIAL REGULATIONS.

(*See also the Regulations on pages 55 to 65.*)

1. Jumping Competitions will take place on the afternoons of Wednesday, Thursday, and Friday, the 18th, 19th, and 20th July.
2. *Entries* for each day's Competitions will close at the Secretary's Office in the Showyard at 6 P.M. on the preceding day.
3. *Entry Fees.*—For classes for Horses—Wednesday, £1; Thursday and Friday, 10s. for each class. Pony classes—Wednesday, 10s.; Thursday and Friday, 5s. for each class.
4. An animal that wins a prize in the Open Class cannot compete in the Pony Class, or *vice versa*.
5. *Accommodation* for jumping horses will be provided as follows:—Covered shed in which to stand during the day free of charge; or, on application to the Secretary not less than seven days before the opening of the Show, stalls or loose-boxes will be provided at a charge (in addition to the Entry Fee) of £1 for a stall, and £1, 10s. for a loose-box, which must be paid along with the Entry Fee at the time of application.
6. Horses entered for jumping only need not enter the Showyard till 12 noon on the day of Competition, and may leave the Showyard at 6 P.M. each day.
7. *The Jumps* may consist of Single Hurdle, Gate, Double Hurdle, Wall, and Water Jump, power being reserved by the Society to alter these, as well as the Handicaps, as may be thought desirable.

Class		1st. £	2nd. £	3rd. £	
	WEDNESDAY.				
1.	Horses—open	20	10	5	
2.	Ponies, 14.3 hands and under	10	5	3	
	THURSDAY.				
3.	Horses, Open Handicap, hurdles and gate being raised 8 inches for the winner of the first prize, and 4 inches for the winner of the second prize in Class 1	10	6	3	
4.	Ponies, 14.3 hands or under, Handicap, hurdles and gate being raised 4 inches for first prize winner in Class 2	5	3	1	
	FRIDAY.				
5.	Horses, Open Handicap, hurdles and gate being raised 8 inches for the winner of the first prize, and 4 inches for the winner of the second prize in either of Classes 1 or 3—4 inches extra for the winner of the two first prizes in Classes 1 and 3	10	6	3	
6.	Ponies, 14.3 hands or under, Handicap, hurdles and gate being raised 4 inches for the winner of the first prize in Class 2 or in Class 4, and 8 inches for winner of the first prize in both these Classes	5	3	1	
	Champion Prize for most points in Prizes with one or more horses in above Classes—First Prize to count three points; Second Prize, two points; and Third Prize, one point. The money to be evenly divided in the event of a tie	10	0	0	
					£119

SHEEP

BLACKFACED.

Class		1st. £	2nd. £	3rd. £	4th. £	
76.	Tup above one shear	12	8	4	2	
77.	Shearling Tup	12	8	4	2	
78.	Ewe above one shear, with her Lamb at foot	10	5	2	—	
79.	Shearling Ewe or Gimmer	10	5	2	—	
						£86

[1] The Breeders' Prize of £10 for the five best Blackfaced Tups, bred by and never out of the possession of the Exhibitor, entered in above Classes.

President's Medal for best pen of Blackfaced Sheep.

CHEVIOT.

80.	Tup above one shear	12	8	4	2	
81.	Shearling Tup	12	8	4	2	
82.	Ewe above one shear, with her Lamb at foot	10	5	2	—	
83.	Shearling Ewe or Gimmer	10	5	2	—	
						86

President's Medal for best pen of Cheviot Sheep.

BORDER LEICESTER.

Tweeddale Gold Medal for Best Border Leicester Tup—£20.

84.	Tup above one shear	12	8	4	2	
85.	Shearling Tup	12	8	4	2	
86.	Ewe above one shear	10	5	2	—	
87.	Shearling Ewe or Gimmer	10	5	2	—	
						86

President's Medal for best pen of Border Leicesters

HALF-BRED.

88.	Tup above one shear	12	8	4	2	
89.	Shearling Tup	12	8	4	2	
90.	Ewe above one shear	10	5	2	—	
91.	Shearling Ewe or Gimmer	10	5	2	—	
						86

[2] Best Half-bred Tup in above Classes—£5.

[2] Best Half-bred Ewe or Gimmer in above Classes—£5.

President's Medal for best pen of Half-Breds.

Carry forward £344

[1] Given by Mr C. Howatson of Glenbuck.
[2] Given by Breeders, per Mr Bertram.

		1st.	2nd.	3rd.	
	Brought forward				£314
		Premiums.			
	SHROPSHIRE.				
Class		£	£	£	
92.	Tup above one shear . .	6	4	2	
93.	Shearling Tup . . .	6	4	2	
94.	Ewe above one shear . .	5	3	2	
95.	Shearling Ewe or Gimmer . .	5	3	2	
					44
	President's Medal for best pen of Shropshires.				
	OXFORD-DOWNS.				
96.	Shearling Tup . . .	6	4	2	
97.	Shearling Ewe or Gimmer . .	5	3	2	
					22
	President's Medal for best pen of Oxford-Downs.				
	SUFFOLK.				
98.	Shearling Tup . . .	6	4	2	
99.	Shearling Ewe or Gimmer . .	5	3	2	
100.	[1] Three Ewe Lambs, £5, £3, and £2.				22
	President's Medal for best pen of Suffolk Sheep.				
	EXTRA SECTIONS.				
101.	Three Blackfaced Wethers, one shear	5	3	—	
102.	Three Cheviot Wethers, one shear .	5	3	—	
103.	Three Shearling Wethers, any cross out of Blackfaced Ewes . .	5	3	—	
104.	Five Fat Lambs, any breed or cross, dropped after 1st January of the year of the Show . .	5	3	—	
					32
					£464

[1] Best pen of Lambs in Class 101 got by a Suffolk Tup, and out of Cheviot or Blackfaced Ewes—£5.

[1] Best pen of Lambs in Class 104 got by a Suffolk Tup, and out of Border Leicester, Half-bred, or Three-parts-bred Ewes—£5.

[2] Best pens of Cross-bred Lambs in Class 104 got by an Oxford-Down Tup—£6, £4, and £3.

WOOL.

105 [3] Blackface Wether Wool, five fleeces—£3, £2, £1.

106. [3] Blackface Ewe Wool, five fleeces—£3, £2, £1.

107. [3] Blackface Ewe or Wether Hogg Wool, five fleeces—£3, £2, £1.

Note.—All fleeces must be white, unwashed, and shorn from sheep bred and reared on, or regular stock of, the Exhibitor's farm.

[1] Given by the Suffolk Sheep Society.
[2] Given by Oxford-Down Sheep Breeders' Association.
[3] Given by Sir Robert Menzies, Bart.

SWINE

Class		Premiums. 1st.	2nd.	
	LARGE WHITE BREED.	£	£	
108.	Boar	5	3	
109.	Sow	5	3	
110.	Three Pigs, not above 8 months old	4	2	
				£22
	WHITE BREED OTHER THAN LARGE.			
111.	Boar	5	3	
112.	Sow	5	3	
113.	Three Pigs, not above 8 months old	4	2	
				22
	BERKSHIRE.			
114.	Boar	5	3	
115.	Sow	5	3	
116.	Three Pigs, not above 8 months old	4	2	
	President's Medal for best pen of Swine.			22
				£66

EXTRA STOCK

Animals not included in the Classes for Competition may be exhibited as Extra Stock, and may receive Awards as follows:—Very Highly Commended, or Highly Commended, carrying the Medium Silver Medal, or Commended, for which the Bronze Medal is given.

Animals entered as Extra Stock are eligible to compete for the President's Medals, whether former winners of these Medals or not.

POULTRY

First Premium—ONE SOVEREIGN; *Second Premium*—TEN SHILLINGS. In each Class in which there are six or more entries, a Third Prize of Five Shillings may be awarded, provided there is sufficient merit in the pens. Three or more Commendations may also be given; thus, Very Highly Commended, Highly Commended, and Commended.

Champion Medals—President's Medals are offered as follows:—

1. Best Cock, any Variety.
2. Best Hen, any Variety.
3. Best Cockerel, any Variety.
4. Best Pullet, any Variety.
5. Best Pen of Ducks.
6. Best Pen of Geese.
7. Best Pen of Turkeys.

Aged Birds must have been hatched previous to, and Cockerels and Pullets in, the year of the Show.

	Class
DORKING—	
Coloured	1. Cock
	2. Hen
	3. Cockerel
	4. Pullet
Silver Grey	5. Cock
DORKING—	
Silver Grey	6. Hen
	7. Cockerel
	8. Pullet
COCHIN-CHINA	9. Cock
	10. Hen

	Class	
BRAHMAPOOTRA . .	11.	Cock
	12.	Hen
BRAHMA or COCHIN .	13.	Cockerel
	14.	Pullet
SCOTCH GREY . .	15.	Cock
	16.	Hen
	17.	Cockerel
	18.	Pullet
HAMBURG—		
Black . . .	19.	Cock
	20.	Hen
Any other Variety .	21.	Cock
	22.	Hen
Any Variety . .	23.	Cockerel
	24.	Pullet
PLYMOUTH ROCK .	25.	Cock
	26.	Hen
	27.	Cockerel
	28.	Pullet
MINORCA . . .	29.	Cock
	30.	Hen
	31.	Cockerel
	32.	Pullet
LEGHORN—		
White . . .	33.	Cock
	34.	Hen
Any other Variety .	35.	Cock
	36.	Hen
Any Variety . .	37.	Cockerel
	38.	Pullet
LANGSHAN . . .	39.	Cock
	40.	Hen
ORPINGTON . . .	41.	Cock
	42.	Hen
LANGSHAN or ORPINGTON	43.	Cockerel
	44.	Pullet
WYANDOTTE—		
Gold or Silver . .	45.	Cock
	46.	Hen
WYANDOTTE—		
Any other Variety .	47.	Cock
	48.	Hen
Any Variety . .	49.	Cockerel
	50.	Pullet

	Class	
GAME—		
Old English . .	51.	Cock
	52.	Hen
Indian . . .	53.	Cock
	54.	Hen
Modern . . .	55.	Cock
	56.	Hen
Any Variety, including Old English and Indian . . .	57.	Cockerel
	58.	Pullet
BANTAM—		
Game, any Variety, including Old English and Indian . .	59.	Cock
	60.	Hen
Any other Variety Bantam . .	61.	Cock
	62.	Hen
ANY OTHER RECOGNISED BREED OF POULTRY .	63.	Cock
	64.	Hen
	65.	Cockerel
	66.	Pullet
DUCKS—		
Aylesbury . .	67.	Drake
	68.	Duck
	69.	Drake (Young)
	70.	Duck (Young)
Rouen . . .	71.	Drake
	72.	Duck
Any other Variety .	73.	Drake
	74.	Duck
Any Breed (Aylesbury excepted) .	75.	Drake (Young)
	76.	Duck (Young)
GEESE	77.	Gander
	78.	Goose
TURKEYS . . .	79.	Cock
	80.	Hen

Amount of Poultry Premiums, £140.

DAIRY PRODUCE

No Exhibitor to show more than one lot in any Class.

Class	Premiums. 1st. £	2nd. £	3rd. £	4th. £
1. Cured Butter, not less than 7 lb.				
2. Powdered Butter, not less than 7 lb.				
3. Fresh Butter, three 1-lb. rolls				
4. Cheddar Cheese, 56 lb. and upwards				
5. Cheddar Cheese, 14 lb. and under				

£40

ABSTRACT OF PREMIUMS.

(22 Champion Medals given by LORD BALFOUR OF BURLEIGH.)

GIVEN BY THE SOCIETY.

1. Cattle	£858	0	0
2. Horses	768	0	0
3. Jumping	119	0	0
4. Sheep	464	0	0
5. Swine	66	0	0
6. Poultry	140	0	0
7. Dairy Produce	40	0	0
8. Medals to Breeders, &c.	20	0	0
	£2475	0	0

CONTRIBUTED PRIZES.

1. The Shorthorn Society	£20	0	0			
2. Sir George Macpherson Grant, Bart.	50	0	0			
3. The late Mr C. Macpherson Grant of Drumduan,—Cups	50	0	0			
4. Mr Alexander M. Gordon of Newton	10	10	0			
5. Polled Cattle Society	10	0	0			
6. Lord Malcolm and Mr T. V. Smith	20	0	0			
7. Cawdor Challenge Cup	52	10	0			
8. Bequest by late Miss Murdoch	10	0	0			
9. Sir John Gilmour, Bart.	25	0	0			
10. Captain Clayhills Henderson	27	0	0			
11. Hunters' Improvement Society	10	10	0			
12. Hackney Horse Society	10	0	0			
13. Mr R. W. R. Mackenzie	10	10	0			
14. Mrs Hope Johnstone, and others	12	12	0			
15. Mr Howatson of Glenbuck	10	0	0			
16. Breeders of Half-bred Sheep	10	0	0			
17. Oxford-Down Sheep-Breeders' Association	13	0	0			
18. Suffolk Sheep Society	20	0	0			
19. Sir Robert Menzies, Bart.	18	0	0			
20. Tweeddale Gold Medal	20	0	0			
				409	12	0
				£2881	12	0

JAMES MACDONALD, *Secretary*.

3 GEORGE IV. BRIDGE,
EDINBURGH, *February* 1900

The Society's Show for 1901 will be held at Inverness on the 16th, 17th, 18th, and 19th July.

MEMBERS ADMITTED SINCE THE LIST WAS PUBLISHED IN FEBRUARY 1899.

ARRANGED ACCORDING TO SHOW DISTRICTS.

ELECTED JUNE 7, 1899, AND JANUARY 31, 1900.

1.—GLASGOW DISTRICT.

ARGYLL.

Admitted
1899 Blackburn, Major Hugh, Annat, Conpach
1899 Downie, James MacAlpine, of Appin, Oban
1900 Fulton, James, Balino, Kilmore, Oban
1899 Graham, Robt. Francis, of Skipness, Argyllshire
1899 M'Dougall, James, Tarbert, Argyllshire
1899 Roedemer, Charles Steuart, Factor, Benmore, Kilmun
1900 Turner, Charles, Corrachaive, Dunoon
1899 Young, Robert, Knockrioch, Campbeltown

AYR.

1899 Austin, Robert D. J. Mein, Blackolachrie, Barrhill
1899 Barr, Thomas, Monkland, Kilmarnock
1899 Boswell, J. D., of Garrallan, Cumnock (18 Hill Street, Edinburgh)
1899 Cochrane, John, Nethercraig, Crosshouse, Kilmarnock
1899 Donald, William, Fardelhill, Kilmarnock
1899 Douglas, Thos. A., M.R.C.V.S., Kilmarnock
1899 Dunlop, James, Gree, Fenwick
1899 Gowans, James, Dinwoodie, Hollybush, Ayrshire
1899 Houldsworth, W. T. R., Coodham, Kilmarnock
1899 Hunter, John S., Foulton, Monkton
1899 Maxwell, William, Sparnelbank, Galston
1900 Niell, Thomas, Shawhill House, Hurlford, Kilmarnock
1899 Paton, R. Johnston (W. & T. Samson), Kilmarnock
1899 Roxburgh, John, Grain Merchant, Mauchline
1899 Salomons, Philip Arthur, Reidstone, Drongan

LANARK.

1899 Aitken, Wm., Lewenside, Carnwarth
1900 Boyd, Gavin, Newhouse, Lanark
1899 Carruthers, James Richardson, 70 King Street, Tradeston, Glasgow
1899 Cochrane, James, Brownside, Strathaven
1899 Dickie, Robert, Grain Merchant, 45 Waterloo Street, Glasgow
1900 Ferguson, Alex., of Clelland, Garnkirk House, Chryston
1900 Hamilton, David, 80 Millbrae Road, Langside, Glasgow
1900 Hamilton, James, 60 East John Street, Glasgow
1899 Hood, Wm., Nile Park, 1 Albert Drive, Pollokshields
1899 Jack, Robt., Implement Agent, Hyndford Place, Lanark
1899 Kerr, Alex. Leopold, 307 St Vincent Street, Glasgow
1899 Kerr, Thomas B. B., 307 St Vincent St., Glasgow
1899 M'Culloch, David, The Inn, Forth, Lanarkshire
1900 Prentice, James, Carolside, Uddingston
1899 Ruthven, Lord, Barncluith, Hamilton
1900 Sellar, William, 1 Spring Gardens, Kelvinside, Glasgow
1899 Struthers, Jas. C., 70 Paisley Road West, Glasgow
1899 Taylor, J. P. Ross, 1 Marchmont Terrace, Glasgow
1899 Walker, Jas., Dairyman, Stewarton St., Wishaw
1899 Watson, Wm., M.D., Gartmore, Langside, Glasgow
1899 Wilson, John, M.P., of Airdrie House, Airdrie

RENFREW.

1899 Mure, William, Caldwell House, Glasgow
1900 Renfrew, Wm., Ferguslie Farm, Paisley

2.—PERTH DISTRICT.

FIFE.

1900 Adamson, David, Balmullo, Leuchars
1899 Allison, Alexander, Cult Mill, Ladybank
1900 Balfour, James, Baldastard, Largo
1900 Barclay, Patrick, Craigend, Leslie
1900 Barclay, Robt., Auchmuir, Leslie
1900 Beath, Thomas, Farmlands, Leslie
1899 Bennet, David, Merchant, Saline, Dunfermline
1900 Berwick, William, Stravithie, R.S.O.
1899 Bowman, David W., Newark, St Monance
1899 Davidson, Peter, East Craigfoodie, Dairsie
1899 Dingwall, Andrew, Caiplie, Anstruther
1899 Fortune, George R., Charleton, Colinsburgh
1900 Graham, Lewis, Balrymonth, St Andrews
1899 Guild, William, of Lindores, Parkhill, Newburgh
1900 Hill, William, East Baldridge, Dunfermline
1899 Leburn, Patrick M. G., Gateside House, Gateside
1900 M'Kerchar, John, Pitbauchlie, Dunfermline
1899 Mitchell, James, Schoolhouse, Boreland, Dysart
1899 Mitchell, Stuart, Newbigging, Burntisland
1899 Morton, John P., Broomhall, Dunfermline
1899 Ramage, M., Ashgrove, Windygates
1900 Ritchie, William, Plains, Auchtermuchty
1899 Roger, John M., Balgone, St Andrews
1899 Russell, Thos., Pilmuir, Lundin Links
1899 Rutherford, William, Thirdpart, Crail
1900 Sime, Wm. Webster, Downfield, Ladybank
1900 Stevenson, David, Sauchenbush, Kirkcaldy
1899 Stewart, W. M., St Colme House, Aberdour
1899 Thomson, David (Flear & Thomson), Dunfermline
1899 Wallace, Wm., Buckthorns, Largo
1899 Yule, John, Sauchope, Crail

FORFAR.

(Western Division.)

1900 Bell, James, Corston, Coupar-Angus
1899 Brown, Wm. Donaldson, Drumgley, Forfar
1899 Crichton, Charles M., Estates Office, Glamis
1899 Fenton, W. F., Kinalty, Kirriemuir
1899 Harvey, Miss L., Kinpurney, Newtyle
1899 Johnston, David, Bank of Scotland Buildings, Dundee
1900 Murray, David Smith, of Lintrose, Coupar-Angus
1900 Pattullo, Hugh, Newton of Airlie, Kirriemuir
1899 Smith, Jas., West Inch, Kirriemuir
1899 Steele, Robert, Wormit, Dundee
1899 Tasker, Wm., jun., Camno, Meigle
1899 Waterston, David, Estates Office, Glamis
1899 Whyte, Alexander Hatton, of Eassie, Glamis

KINROSS.

1900 Ferguson, William Crawford, Burleigh, Milnathort
1899 Meiklem, Robert, Lochran, Blairadam

PERTH.

(Eastern Division.)

1899 Bell, George, South Inchmichael, Errol
1899 Beveridge, James, The Cotton, Aberdalgie, Perth
1899 Carruth, Arch., West Cultmalundie, Tibbermore, Perth
1899 Doig, James, Haughend, Meigle
1899 Fenwick, William, Kinfauns, Perth
1900 Ferguson, Thos., Pictstonhill, Perth
1899 Grant, W. J. B., Bengarth, Blairgowrie
1899 Lumsden, Robert Oswald, Pitcairnfield, Perth
1899 M'Beath, Wm., Mains of Orchill, Killiecrankie
1899 M'Donald, William, Dunalistair Estate Office, Kinloch-Rannoch
1900 Marshall, John, Horse-hirer, Perth
1899 Nicholson, Alex., Stronachie Distillery, Path of Struie, Forgandenny
1900 Proudfoot, D. Y., Waverley Hotel, Perth
1900 Robertson, Charles, Trochrie, Strathbraan, Dunkeld
1899 Robertson, George, Innernytie, Stanley
1899 Scott, D. W., Parkhead, Blairgowrie
1899 Scott, J. G., Moorfield, Coupar-Angus
1899 Stewart, Alex., Netherton, Fonab, Pitlochr
1899 Stewart, Jas., Moncreiffe Estate Office, Bridge of Earn
1900 Thomson, Andrew, D.Sc., Perth Academy, Perth
1899 Whitson, Dr James, of Essendy, Meikleour (13 Somerset Place, Glasgow)

3.—STIRLING DISTRICT.

CLACKMANNAN.

1900 Donaldson, Robert, M.R.C.V.S., 22 Church Street, Alloa
1899 Fisher, John, Jellyholm, Alloa
1900 Gray, Thomas, Seed and Manure Merchant, Alloa
1899 Shields, John, Ludgate, Alloa
1899 Smith, Andrew, Hilton, Alloa

DUMBARTON.

1899 Chapman, William, Ballymenoch, Glenfruin, Helensburgh
1899 Chrystal, Wm. J., of Auchendennan, Alexandria, N.B.
1899 Jardine, Andrew, jun., Ballymenoch, Glenfruin, Helensburgh

PERTH.

(Western Division.)

1899 Bain, James, Thornhill, Perthshire
1899 Buchanan, John Hamilton, yr. of Leny, Callander (4 Doune Terrace, Edin.)
1900 Ewing, George T., Pitkellony, Muthill
1900 MacGregor, Peter, Factor, Cromlix, Dunblane
1899 M'Nee, John, Colony Farm, Crieff
1900 Reid, Andrew T., Auchterarder House, Auchterarder
1900 Reid, Wm. John, Balhaldie, Dunblane
1900 Stewart, Alex., Corscaplie, Dunblane
1899 Stewart, Duncan, of Millhills, Crieff (Gibb's Entry, Nicolson Street, Edin.)
Stirling, John W., Nether Cambushinnie, Braco
1899 Willison, Campbell, Acharn, Killin
1899 Wilson, D. Wm., Lawhill, Auchterarder

STIRLING.

1899 Blackburn, Colonel Peter, of Killearn, Killearn House, Glasgow
1899 Bryce, William, West Cambusdrennie, Stirling
1899 Crawford, Ewing R., of Auchentroig, Buchlyvie
1899 Dewar, Peter, King's Park, Stirling
1899 Leckie, John, Inchwood, Milton of Campsie
1900 Macintyre, John, Sauchieburn House, Stirling
1899 M'Onie, William, of Ballochneck, Buchlyvie
1899 Shorthouse, George W., Sauchie Estates Office, Stirling
1900 Smart, James, Lower Canglour, Stirling
1900 Thomson, William, Cauldbarns, Stirling

4.—EDINBURGH DISTRICT.

EDINBURGH.

1899 Ainslie, Robert, Dodridge, Ford, Dalkeith
1899 Aitken, Alfred N. G., S.S.C., 12 Queen Street
1899 Aitken, David Percy, 4 Garscube Terrace
1899 Alison, John P., D'Arcy, Dalkeith
1899 Alison, Robert Barclay, W.S., 3 Moray Place
1899 Allan, William, Redhaughs, Corstorphine
1899 Allison, R., Lauriston, Davidson's Mains
1899 Alston, James, Crosslee, Stow
1899 Ash, Captain P. C., Alderstone, Newpark, West Calder
1899 Baillie, Alex., East Mains of Ingliston, Ratho Station
1899 Blackwood, Geo. Wm., Gogar Mount, Ratho Station
1899 Blackwood, Jas. Hugh, Gogar Mount, Ratho Station
1899 Borthwick, W., Marchwell, Ratho
1899 Brown, John Mackenzie, The Glen, Musselburgh
1899 Buchanan, James R., Adambrae, Mid-Calder
1899 Clark, John, Balleny, Balerno
1899 Clark, John, S.S.C., 12 Hope Street
1899 Clark, Thos. Bennet, C.A., 64 Queen Street
1899 Cowan, James, 13 Assembly St., Leith
1900 Craig, John, Dreghorn Mains, Colinton
1899 Croall, James Taylor, Castle Terrace
1899 Croall, John Edmund, Castle Terrace
1899 Croall, Robt. Douglas, Castle Terrace
1900 Cross, Robert, 13 Moray Place
1899 Dick, John, Parkhead, West Calder
1900 Dods, Thomas Watson, Polton Farm, Lasswade
1899 Douglas, Walter, Mayfield, Dalkeith
1900 Dun, John S., of Gilston, Heriot
1899 Findlay, John, 3 Rothesay Terrace
1899 Fraser, George M., 13 Drumsheugh Gardens
1899 Fullarton, John, Mid-Kinleith, Currie
1899 Gibson, James P., 33 Regent Terrace
1899 Gillespie, Alex. L., 13 Assembly Street, Leith
1899 Gillies, John, Northfield, Prestonpans
1899 Graham, Robert, Victor Park, Corstorphine
1899 Gray, James L., Elginhaugh, Dalkeith
1899 Gray, William, Braehead, Cramond
1899 Haldane, Francis G., W.S., 60 Queen Street
1900 Hanton, John, Engineer, Dalkeith
1899 Herdman, Thomas A., Southside, Gorebridge
1899 Howden, William, Stoneyhill, Musselburgh
1899 Hunter, James A., Murrayfield Mills, Edinburgh
1899 Hutchison, Wm., Burghlee, Loanhead
1899 Ireland, John S., 122 George Street
1899 Irons, Jas. Hay (Croall & Sons, Ltd.), Castle Terrace
1899 Jamieson, Claude, 21 St Andrew Square
1899 Kerr, Hugh C., Blacksmith, Corstorphine
1899 Knoblauch, Hugo, 22 Baltic Street, Leith
1899 Laird, David Pringle, Pinkhill, Murrayfield
1899 Lawrie, Thomas, Windlestrawlee, Edinburgh
1899 Logan, William, Easter Kinleith, Currie
1899 M'Dougall, And., Willow Bank, Corstorphine
1899 M'Laren, Alex., Rosslynlee, Rosslyn Castle
1899 M'Nee, Peter, 92 Grassmarket
1900 Mathison, James, Dean Park, Craigleith, Edinburgh
1900 Mathison, William, of Shoestanes, Heriot
1899 Melvin, Alex., Commercial Bank, 42 Grassmarket
1899 Mercer, George G., Southfield, Dalkeith
1899 Middleton, John, 42 George Street
1899 Mouat, Alexander, 17 Claremont Park, Leith
1899 Mudge, H. B., 57 Manor Place
1899 Muir, John, Haggs, Kirknewton
1899 Muir, William, Newhouse, Wilkieston
1899 Nairn, William, Edgehead, Dalkeith
1899 Nobbs, Eric Arthur, Edinburgh—*Free Life Member*
1899 Patterson, Thomas L., Hardengreen, Dalkeith
1899 Pearson, Dalziel, W.S., 27 Royal Terrace
1899 Pringle, James, jun., Crichton House, Pathhead, Ford
1899 Riddell, A. Oliver, Craiglockhart House, Slateford
1899 Rose, Alex., 58 Grassmarket
1899 Sanderson, James, Watherston, Stow
1899 Shaw, David, W.S., 1 Thistle Court

1899 Shields, Geo. Bertram, Wallyford, Musselburgh
1899 Skirving, Master Thos. Mylne, Niddrie Mains, Edinburgh
1899 Smith, Henry, W.S., 5 South Charlotte Street
1899 Smith, R. Addison, S.S.C., 10 Heriot Row
1899 Smith, Thomas, Crofthead, Bellsquarry, Mid-Calder
1899 Smith, Wm., West Harwood, West Calder
1899 Snodgrass, Jas., Bryans, Dalkeith
1899 Snodgrass, Matthew W., Langside, Dalkeith
1899 Snodgrass, Peter L., Hopefield, Bonnyrigg
1900 Stirling, John, Prestondene, Dalkeith
1899 Taylor, Thomas W., Seed Merchant, Dalkeith
1899 Thomson, R. J., 2 Wilton Road
1899 Trotter, Alex. E. C., Bush, Milton Bridge
1900 Usher, Robert, 10 Grosvenor Crescent
1899 Wakelin, J., Agricultural Hall, Valleyfield Street
1899 Waldie, D., 25 Douglas Crescent.
1899 Waldie, J. Paterson, Haymarket, Edinburgh
1899 Walker, Peter, Elm Cottage, West Calder
1899 Warden, Ivie, Wester Cowden, Dalkeith
1900 Warden, John S., Wester Cowden, Dalkeith
1899 Weatherston, John, Airfield, Cousland, Dalkeith
1899 White, William, Edgefield, Loanhead
1900 Whitecross, John W., Royal (Dick) Veterinary College, 8 Clyde Street
1899 Wilson, Jas., Torcraik, Gorebridge
1899 Younger, Charles A. J., 42 York Place
1899 Younger, H., yr. of Benmore, Abbey Brewery
1899 Younger, J. A. C., Abbey Brewery
1899 Younger, Wm. J., 21 Douglas Crescent

HADDINGTON.

1899 Brown, Malcolm, jun., Ugston, Haddington
1899 Buist, Robert, Whitekirk, Prestonkirk
1899 Cairns, John, Waughton, Prestonkirk
1899 Dewar, Peter, Murrays, Ormiston
1900 Dickson, James, West Byres, Ormiston
1899 Dods, George, Hedderwick, Dunbar
1899 Elliot, James, Duncra Hill, Pencaitland
1899 Fraser, John H., East Pinkerton, Dunbar
1899 Gemmel, Mathew, Greendykes, Macmerry
1899 Gibson, Walter H., Camptoun, Haddington
1899 Gillespie, Wm., jun., Athelstaneford, Drem
1899 Haldane, R. S., Phantassie, Prestonkirk
1899 Hogg, George, Newlands, Gifford
1899 Jeffrey, James, Denchrie, Prestonkirk
1900 M'Ewen, James, Redside Farm, North Berwick
1899 M'Ewen, John, jun., Balgone Barns, North Berwick
1899 M'Intyre, Peter, Baro, Limplum, Haddington
1899 M'Kelvie, William, Duncanlaw, Gifford
1899 Mason, William, West Fortune, Drem
1899 Matthewson, Adam, Leehouses, Haddington
1900 Maxwell, , Craigielaw Farm, Aberlady
1899 Millar, W., Tranent
1899 Page, Robt., Prestongrange, Prestonpans
1900 Park, John, Setonhill, Longniddry
1899 Parr, John, Abbey Mains, Haddington
1899 Roughead, Arthur Jas., Seed Merchant, Haddington
1899 Russell, Chas., West Mains, Haddington
1899 Shiels, Thomas J., Carfrae, Garvald, Prestonkirk
1899 Stein, John Andrew D., Broomhouse, Dunbar
1899 Stenhouse, Jas., Home Farm, Spott, Dunbar
1899 Stewart, Alex. F., Marvingston, Haddington
1899 Stewart, John, Tanderlane, Prestonkirk
1899 Thomson, Jas., Butcher, Haddington
1899 Turnbull, Phipps, jun., Pinkerton, Dunbar
1899 Walker, John, South Elphinstone, Tranent
1899 Wallace, Forbes, Redcote, Longniddry
1899 Watt, James Wm., New Mains, Drem
1899 Wilson, Robert, Sheriffside, Gifford
1899 Wyllie, Wm. R., Tranent Mains, Tranent

LINLITHGOW.

1899 Addison, John, Ballardie, Bathgate
1899 Alexander, Thos., Nethermuir, Bathgate
1899 Borthwick, James, V.S., Kirkliston
1899 Brownlie, James, Merchant, Fauldhouse
1900 Cadzow, James, jun., Bangour, Uphall
1899 Cæsar, William, Solicitor, Bathgate
1900 Marshall, Provost William, Armadale Linlithgowshire
1899 Neilson, William, Haining Valley, Linlithgow
1899 Storry, John, Stonkeap, Fauldhouse
1900 Watson, Walter, Greendykes, Broxburn

5.—ABERDEEN DISTRICT.

ABERDEEN.

1900 Barclay-Harvey, Jas. Chas., of Kinord, Dinnet
1899 Brown, James, Crosstone, Ellon
1900 Calder, Andrew, Cairnton, Lumphanan
1900 Cantlay, William G., Bridgend, Port Erroll
1899 Chapman, Archibald, of Slackadale, Turriff
1899 Cocker, William, 130 Union Street, Aberdeen
1900 Esslemont, George B., King's Acre, Kingsgate, Aberdeen
1899 Farquharson, Colonel Sir John, K.C.B., Corachree, Tarland
1900 Foggo, Robert Gordon, jun., Invercauld, Braemar
1900 Hendrick, James, B.Sc., F.I.C., The University, Aberdeen
1899 Hutchen, George, Skeen House, Turriff
1900 Leith-Hay, Chas. E. N., of Leith Hall, Kennethmont
1899 Macdonald, W. A., Solicitor, Insch, Aberdeenshire
1899 Robertson, John, Suttie, Fintray
1900 Sim, Geo. F., Lochend, Ardoe, Banchory-Devenick

BANFF.

1899 Bisset, Colin, Home Farm, West Elchies, Aberlour
1899 Farquharson, R. G., Bogarrow, Glenlivet
1899 Greig, John, South Sandlaw, Alvah, Banff
1899 Gunn, Alexander J., Kilnhillock, Cullen
1899 Horn, John A., Brangan, Portsoy
1900 Hutcheon, John, Dovepark, Banff
1899 M'Kenzie, Kenneth D., Birkenhill, Gartly
1899 Wilkinson, Henry Grant, Clunie House, Aberchirder

FORFAR.

(EASTERN DIVISION.)

1899 Maxwell, David, jun., Panlathie Mill, Carnoustie
1900 Pattullo, J. H., Pitskelly, Carnoustie
1900 Stuart, Dudley Charles, Lundie, Brechin
1899 Wilson, James G., Fordhouse, Montrose

KINCARDINE.

1899 Low, Jas. F., of Balmakewan, Marykirk
1900 Milne, Alex., Urie Estates Office, Stonehaven
1900 Nicolson, Arthur B., of Glenbervie, Fordoun

6.—DUMFRIES DISTRICT.

DUMFRIES.

1899 Anderson, W. W., Reddings, Moffat
1900 Boyd, Sam., Chemist, Annan
1899 Brown, Joseph, Holestane, Thornhill
1899 Craig, Edward J., Waterhead, Dryfe, Lockerbie
1900 Donaldson, Andrew, Posting Master, Thornhill
1899 Frood, William John, High Street, Lockerbie
1899 M'Call, Thos., Johnstone Place, Lockerbie
1900 Maxwell, Wellwood Hyslop, Rue, Dumfries
1899 Milne, R. W., 19 Livingstone Place, Lockerbie
1900 Murray, William, of Murraythwaite, Ecclefechan
1900 Paterson, Robert Jardine, of Balgray, Lockerbie
1899 Reid, Charles W., King's Arms Hotel, Lockerbie
1899 Welsh, Tom, Ericstane, Moffat

KIRKCUDBRIGHT.

1899 Corrie, Thomas, Southpark, Kirkcudbright
1899 Neilson, W. Montgomerie, of Queenshill, Kirkcudbrightshire
1899 Phillipps, Charles Aldcroft, of Dildawn, Castle-Douglas
1899 Wotherspoon, George, Kirkcudbright

WIGTOWN.

1899 Kerr, Matthew, Craiglemine, Whithorn
1899 M'Douall, Kenneth, of Logan, Stranraer

7.—INVERNESS DISTRICT.

CAITHNESS.

1899 King, George, Berriedale, Caithness
1899 Nicholson, Daniel, Olrig Mains, Thurso
1900 Sinclair, Donald, Implement Maker, Wick

ELGIN.

1899 Anderson, William, Wester Coltfield, Alves, Forres
1899 Cameron, Ralph C., W.S., Highfield, Elgin
1899 Dean, James, Hatton, Kinloss, Forres
1899 Innes, Peter, Orbliston, Fochabers
1899 Johnstone, John A., Glenburgie Distillery, Elgin
1900 Lawson, D. G., Secretary, Strathspey Farmers' Club, Grantown
1900 Leven and Melville, Earl of, Glenferness, Dunphail
1899 Macdonald, James, Waterton, Duffus, Elgin
1900 Mackenzie, Alex., Mayne, Elgin
1899 Rhind, Alex., Muirhead, Forres
1900 Robertson, Alex., jun., Lethendry, Cromdale
1899 Rose, William M., Toreduff, Alves, Forres
1900 Smith, Samuel M'Call, Shempston, Duffus, Elgin
1899 Turner, James Stuart, Teacher, New Elgin

INVERNESS.

1900 Cran, William John, Kirkton, Bunchrew
1899 Grant, J. W. H., of Wester Elchies, Carron Lodge, Carron, Strathspey
1900 Johnstone, William, Braeton, Inverness
1899 Macdonald, Arch. Wm., Invernevis, Fort-William
1899 Macdonald, Jas. Alex. Ranald, yr. of Balranald, Lochmaddy, No. Uist
1899 Macdonald, Ronald, Solicitor, Portree
1899 MacDonnell, Alex., Dunballoch, Beauly
1899 M'Gillivray, W., Garbole, Tomatin
1899 Mackinlay, James. Muirtown, Inverness
1899 Mackintosh, Hugh, Rosevalley, Fort-George
1900 Macpherson-Grant, G. B., Ballindalloch Castle, Ballindalloch
1899 Robertson, Tom R. S., Lovat Estates Office, Beauly

NAIRN.

1900 Douglas, John R., County Road Surveyor, Nairn

ORKNEY AND SHETLAND.

(ORKNEY.)

1899 Baikie, Alex., Berriedale, St Margaret's Hope
1899 Irvine, James, Stove Farm, Sanday, Orkney

ROSS AND CROMARTY.

1899 Davidson, A. B., Lower Kincraig, Invergordon
1899 Dempster, John, Glastullich, Nigg
1900 Fraser, John, 15 High Street, Dingwall
1899 Macdonald, Alex., Lemlair, Dingwall
1900 Macdonald, Peter, Cattle Salesman, Dingwall
1899 M'Intyre, John, Bellfield, North Kessock
1900 M'Kenzie, Eric G., Ardross Mains, Alness
1899 Mackenzie, Wm. Farquharson, yr. of Dalmore, Alness
1900 Thompson, Alex., Conon Brae, Conon Bridge

SUTHERLAND.

1900 Hardie, Jas. F., Factor, Skibo, Dornoch
1899 Miller, Wm., Balnakeil, Durness, Lairg

8.—BORDER DISTRICT.

BERWICK.

1900 Allan, John, East Reston, Reston
1900 Blagg, Ernest W. H., Boon, Lauder
1900 Brown, Robert, Draper, Duns
1899 Dickinson, William Bell, Longcroft, Lauder
1899 Ewart, George, Teindhill, Duns
1900 Fairbairn, John, Maxmill, Gordon
1900 Gilmour, John, Solicitor, Duns
1900 Holme, Chas. H., of Rathburne, Duns
1900 Johnston, John, Sisterpath, Duns (Scott Craig Villa, Viewforth, Edinburgh)
1899 Liddell-Grainger, Henry, Ayton Castle, Ayton
1900 Wight, James, Greenwood, Grant's House
1900 Wilson, Philip, Corn Factor, Duns

PEEBLES.

1899 Cunningham, Captain John, yr. of Leithenhopes, Innerleithen
1899 Whyte, John D. B., Castlecraig, Dolphinton

ROXBURGH.

1899 Binning, Lieut.-Colonel Lord, Mellerstain, Kelso
1899 Davidson, Gilbert, Barnhills, Minto, Hawick
1899 Grieve, Wm. Oliver, Shaws, Newcastleton
1900 Hilson, Sydney, Solicitor, Jedburgh
1899 Mitchell, John Peace, Dryburgh Orchard, St Boswells
1899 Monteath, George, Newtown, St Boswells
1899 Pearson, Thos. Smith, of Otterburn, Morebattle, Kelso
1899 Simson, Alex. Tudhope, Brewer, Melrose
1899 Tully, Alex. B., V.S., Kelso
1900 Veitch, Arch., Cattle Salesman, Jedburgh
1899 Wood, Wm., Rachaelfield, Kelso

SELKIRK.

1899 Arthur, Matthew, Lindean, Selkirk
1899 Burns, James (George Burns & Sons, Engineers), Galashiels
1900 Hogarth, James, Miller, Galashiels
1899 Young, Wm., Halkburn, Galashiels

ENGLAND.

1899 Abram, Laurence, Durham College of Science, Newcastle-on-Tyne—*Free Life Member*
1900 Barclay, John, Junior Constitutional Club, Piccadilly, London
1899 Birge, Wm. B., Piano Manufacturing Co., 115 Southwark St., London, S.E.
1899 Brown, Ernest C., Manor House, Marske, Richmond—*Free Life Member*
1899 Cole, John Thomson, Fell Court, Torquay—*Free Life Member*
1899 Cundall, John Samuel, Airedale Iron Works, Shipley
1899 Dellschaft, Adolf H., 21 Drayton Park, Highbury, London, N.—*Free Life Member*
1899 Harrison, Wm. S., Agricultural College, Aspatria—*Free Life Member*
1899 Hewitt, Thomas G., M.R.C.V.S., 22 Dorset Street, Baker St., London, W.
1899 Hinchcliff, Joseph H., Commercial Road, Skelmanthorpe, Huddersfield — *Free Life Member*
1899 Holmes, Thomas R., Witton Hall, Witton Gilbert, Co. Durham
1899 Jefferson, J., Peel Hall, Chester
1899 Johnstone, Mrs Wentworth Hope, Skeynes, Edenbridge, Kent
1899 Johnstone, Wentworth Hope, Skeynes, Edenbridge, Kent
1899 Kerr, John Lindsay, Home Farm, Heaton Park, Lancashire
1899 Macdonald, A. J., Estate Office, Edenhall, Langwathby, R.S.O., Cumberland
1899 Newton, Thos., The Bent, Warburton, Warrington—*Free Life Member*
1899 Nicol, R. P., East Carlton, Market Harborough
1899 Potts, George, Whitchurworth, Trimdon Grange—*Free Life Member*
1899 Sampson, Hugh C., Westwood, Darlington—*Free Life Member*
1899 Thorley, Joe, Ringdale, Faringdon, Berks (of Joseph Thorley, Ltd., London)
1900 Wigram, Oswald L., Maiden Hill, Penrith
1899 Wilson, John, Hilsington, Laithes, Kendal
1899 Winter, Thos., Springfield House, Sherburn, Yorkshire

IRELAND.

1900 Strachan, James, Land Steward, Annegrove, Carrigtwohill, Co. Cork.

DIPLOMA HOLDERS, FREE LIFE MEMBERS.

1899 Abram, Laurence, Durham College of Science, Newcastle-on-Tyne
1899 Brown, Ernest C., Manor House, Marske, Richmond
1899 Cole, John Thomson, Fell Court, Torquay
1899 Dellschaft, Adolf H., 21 Drayton Park, Highbury, London, N.
1899 Harrison, Wm. S., Agricultural College, Aspatria
1899 Hinchcliff, Joseph H., Commercial Road, Skelmanthorpe, Huddersfield
1899 Newton, Thos., The Bent, Warburton, Warrington
1899 Potts, George, Whitchurworth, Trimdon Grange
1899 Sampson, Hugh C., Westwood, Darlington.

HOLDERS OF FIRST-CLASS CERTIFICATE IN FORESTRY, FREE LIFE MEMBERS.

1899 Potts, George, Whitchurworth, Trimdon Grange
1899 Nobbs, Eric Arthur, Edinburgh

Number of Members in List published in February 1899 . . .	5760
Number of Members admitted in June 1899	328
Number of Members admitted in January 1900	111
Number of Diploma and Certificate Holders admitted in June 1899 .	10
	6209
Deduct estimated deaths, &c.	159
Total . .	6050

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